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ABSTRACT

An informed citizenry is capable of making decisions about economic development that have a potentially positive impact on the environment. This classroom guide is about tropical forests and development in three major regions of the world: Africa, Asia, and Latin America. The resources and activities are organized into three parts. The first section gives the teachers and students basic definitions of forest types, identifies world forest regions, and gives a summary of important development issues in the three regions. Issues discussed include the importance of education about development and the environment, the concept of sustainable development, and the importance of rain forests. The second section is a set of lessons containing 20 activities that present 3 principles for sustainable development: interrelationships and interdependence; stability and change; and human responsibility. The concept, objectives, related subjects, materials, time, background information, and procedures are provided for each activity. The third section contains additional resources for teachers and students that include a glossary of 20 terms, a list of people and organizational resources, and a list of 6 publications and references. (MDH)

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AMERICAN FORESTS

World Forests:
Striking a Balance Between Conservation and Development

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Activities and Resources about
Tropical Forests, Conservation, Sustainable Development & Citizenship

SE 054 031

Global ReLeaf World Forests

A Classroom Guide

AMERICAN FORESTS
1516 P Street, NW
Washington, DC 20005

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Acknowledgments

This classroom guide is the result of many people's work. They came together to explore how best to help students in the classroom begin to think through the very complex issues of sustainable development. All were motivated by a desire to make available a teaching tool that could be used to help foster ideas of responsible leadership and citizenship in an increasingly interdependent world. In the true spirit of sustainable development, the following people and organizations gave their time, energy, and resources to help AMERICAN FORESTS meet teacher's classroom needs for easy-to-use materials on difficult issues:

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Dear Educator:

Since 1875, AMERICAN FORESTS has provided useful, practical information about trees, forests, and environmental quality to citizens, policy makers, teachers, and students. In the 1990s, AMERICAN FORESTS continues to bring information about the importance of trees and forests to the public with assistance from scientists, public agencies, and private sector firms. Bull Worldwide Information Systems provided critical technical support and funding to make this classroom guide available for schools and teachers.

Students need to know that their knowledge, actions, and leadership are meaningful. Increasingly, that means they need to be aware of global issues, such as tropical deforestation, and the effect such issues have at the local level.

This classroom guide is about tropical forests and development in three major regions of the world — Africa, Asia, and Latin America. It is meant to supplement existing material to expand curricula to include issues of environment, development, and citizenship. Please note that to take full advantage of the materials students need a basic understanding of geography, spatial relationships, ecology, and diverse cultures. The activities are structured so you can tailor them to meet individual class needs, subject matter, grade level, and educational objectives.

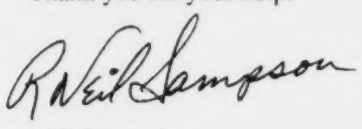
People throughout the world are concerned with food, shelter, jobs, and environmental quality. Students will find similarities between the issues discussed in these activities and ones in their own community. For example, the employment versus endangered species controversy in the Pacific Northwest in many ways resembles the controversy over economic growth in Malaysia and the property rights of indigenous forest dwellers.

AMERICAN FORESTS created these activities with the help of teachers in Alaska, California, Florida, Michigan, Missouri, New Hampshire, Pennsylvania, and Texas. Beginning in 1990, AMERICAN FORESTS convened three meetings of classroom teachers to review materials on tropical forests, sustainable development, and citizenship. They were asked to recommend how best to introduce these complex issues into the classroom.

This activity and resource book is the result of their work. In addition to Bull Worldwide Information Systems, the entire process was made possible with assistance from: ARCO Foundation, CONOCO Inc., Francis Family Foundation, National Geographic Society Education Foundation, and United States Agency for International Development.

Please review the materials and let us know what you think. Your suggestions will be incorporated into future revisions. Send your comments to: **AMERICAN FORESTS**, Education Program, P.O. Box 2000, Washington, DC 20013.

Thank you for your help.



R. Neil Sampson,
Executive Vice President

Preface: *Using This Classroom Guide*

This guide to resources and activities is organized into three parts:

1. An overview of tropical forests and sustainable development.
2. A set of classroom lessons and activities.
3. Additional resources and references.

The first section gives teachers and students basic definitions of forest types, identifies world forest regions, and gives a summary of important development issues in Africa, Asia, and Latin America. It also shows the importance of healthy forest ecosystems to human development. Some of the sections may be suitable as student handouts. However, teachers are encouraged to use library resources and experts in their local area to provide additional depth.

The second section is a set of lessons and activities to help the teacher introduce concepts important for understanding forests and sustainable development. Three broad principles for sustainable development are illustrated throughout this curriculum: Interrelationships, stability and change, and human responsibility.

Lessons 1 and 2 begin with simple exercises to draw students' attention to the wider world and its impact on the home environment. They are followed by activities that introduce the relationships of forests to human development. Case studies from Latin American, Africa, and Asia that illustrate major forest and development issues are the focus of lesson 3. In the final activities students begin their own discussions of what responsible citizenship may mean for their future.

A resource directory to environment and development issues and a glossary complete this guide.

Introduction: *Just The Facts – Issues to Think About*

- After the Second World War, developing countries and regions experienced population "growth" as death rates dropped and birth rates stayed the same.
- The world's population doubled between 1950 and 1990. By 2000, there will be over 6 billion people in the world.
- Over half the people in the world depend directly on forests and trees for food, energy, and shelter.
- Human population growth is expected to stabilize between 8 billion and 12 billion sometime during the 21st century.
- Most population growth is located in the tropical regions of Africa, Asia, and Latin America.
- About 50 million acres of forests were converted to non-forest lands every year in the 1980s.
- In the 1980s, 44 million acres of forest plantations were successfully established.
- Human activity has transformed about 10% of the Earth's surface into deserts or near deserts.
- If population projections are accurate, the amount of cropland per capita will decline in all regions of the world.
- Continued population growth may require that 35 million acres of forest are converted to agricultural land each year.
- There are tens of thousand of citizens groups and non-governmental organizations around the world successfully educating people about the importance of trees and planting forests.
- In 1992, the world's leaders established the Commission on Sustainable Development.
- Most of the forest land in the world is claimed by governments.

Overview: Sustainable Development, Citizenship, and Tropical Forests

What might the future hold for today's young people? The way that people will live out their lives will be influenced by global patterns of environmental and economic change. Understanding how forests are changing globally as economies and nations change is the first step to understanding and influencing the future.

What is so Important about Development Education and the Environment?

Four major issues will confront today's youth when they mature into adults and take their place as responsible citizens. They will be making decisions in a world of increasing populations, widening income gaps between nations, dwindling natural resources, and increased economic competition.

They will need to understand the important role that forests, especially tropical forests, play in human progress. Furthermore, they will need to understand the very complex relationships that are implied by the term "sustainable development."

Understanding that human progress is dependent on healthy forest ecosystems is necessary for the exercise of responsible citizenship. This is true not only with respect to issues within the United States, but also to the global impact of changing environments. Education directed toward the future sustainability of environment and society must teach about the relationships between people and natural resources.

Development education teaches about interdependence between nations and people. Is this a new idea? No. George Washington thought about it — he used the phrase "entangling alliances" ...and warned against them. Since the 1790s, economic and political interdependence between nations has become a part of our lives. President Eisenhower described it this way in 1959: "What we call foreign affairs is no longer foreign affairs. It's a local affair. Whatever happens in Indonesia is important to Indiana. Whatever happens in my corner of the world has some effect on the farmer in Dickinson County, Kansas, or on a worker in a factory."

The concept of interdependence is also critical to understanding the environment and its relationship to people. After all, environment means "context." There are human-made environments such as cities and there are natural environments like the Amazon forests or the Grand Canyon. Throughout time, people have altered, controlled, destroyed, preserved, protected, and conserved the natural world around them.

Understanding how people create and transform environments is crucial to identifying problems and responsible solutions. Such knowledge is the "gold" for future generations. A modified Golden Rule, "He who holds the gold Rules," is a reality for most people. For many people knowledge is necessary to compile information, evaluate alternatives, and select appropriate courses of action to manage natural resources for long-term productivity and environmental well-being in the global context.

What is Sustainable Development?

The short answer is that no one knows what sustainable development means in practice. In the 1980s, political leaders, development experts, and concerned citizens began a discussion to define sustainable development. They were concerned about the trends they were observing, especially rapid population increases, greater concentrations of urban people, the depletion of natural resources, and the perception of increased economic inequality between nations. They also were concerned about global climate change and increasing rates of deforestation. In 1987, the World Commission on Environment and Development presented a definition that has won widespread acceptance:

Sustainable development is a process that meets the needs of the present without limiting the potential of future generations to meet their own needs.

As governments and development institutions begin pursuing economic policies based on the World Commission's definition, it will be up to today's young people to give meaning to the term. As young people mature into citizens and exercise leadership, they will use what they have learned in school to make their decisions. How they make their decisions will influence relationships between people and nations. Some of the most important decisions will have to do with how people use forest resources.

The fate of tropical forests will be determined by how emerging leaders respond to increasing population, widening income gaps, and diminished natural resources. Future leaders will need ideas and knowledge to face this task.

Education must teach students skills for life long learning. In other words, development education is more than simply lessons and activties on a particular topic. Rather, it is an array of events and philosophies molded into an interdisciplinary curriculum to provide people with new knowledge – knowledge that causes them to do things differently than before.

What sustainable development comes to mean in the future will depend on what young people learn in their schools today.

What's at Stake — Why is Learning About Tropical Forests So Important?

Between 1850 and 1980, nearly 15 per cent of the world's forests disappeared. From 1981 through 1990, 15,400,000 hectares of tropical forests were lost each year. In the first part of the 1990s, over two and a half billion people in the tropics depend on forests for their existence. At the same time, the total world population is about 5.5 billion. It is expected to exceed 6.2 billion people by 2000, and 8.5 billion by 2025.

The Issues:
Growing populations and declining resource bases will force citizens and their leaders to address fundamental economic and development issues. Learning about tropical forests is important for our survival.

The destruction of tropical forests, or at least tropical rainforests, is an issue with which many U.S. citizens have become familiar. They are beginning to recognize the dangers of tropical deforestation in terms of global climate change and the loss of species diversity.

Familiarity with these issues is inadequate, however, considering the urgency and complexity of the problem. Many North Americans think of tropical forests as tangled jungles, perpetually raining and perpetually steaming, filled with exotic plants, peculiar animals and lethal hazards like rapacious army ants, poisonous spiders, swampy quagmires, giant constrictor snakes and silent black hunting cats. Furthermore, many people think the biggest threat to tropical forests is uncontrolled logging for international markets.

These perceptions do not represent the entire picture. For instance, less than half of tropical forests are rainforests. Not all rainforests are in the tropics. The coastal forests of the Pacific Northwest are also rainforests. There are tropical forests as dry as the "jungle" is wet. Most forest types fall somewhere between these extremes. Seasonal forests where it rains only during monsoons; elongated "gallery forests" that border rivers; montane and cold elfin cloud forests far up the slopes of mountains; and variations of evergreen and deciduous forests, spanning a wide range of climates and terrain that make up the tropics.

Similarly, while commercial logging is a serious threat to the integrity of some tropical forest ecosystems, the most serious threat comes from people needing or wanting land for crops, grazing livestock and fuelwood. Poor farmers, migrants from overcrowded cities and infertile farms, displaced indigenous tribes, ranchers and national governments put pressure on forests. Thousands of acres of forests are converted daily. Many forest systems are weakened by millions of people performing the simple act of finding fuelwood to cook the day's meal.

The tragedy of deforestation, whether for profit or daily survival, is the ultimate destruction of the real economic value of forests. Healthy economies depend on healthy forest ecosystems, not only for the commercial value of timber products, but also because forests control soil erosion, help regulate weather patterns, provide resources for medicine, fuel for poor people, and food.

What are Tropical Forests?

Tropical forests straddle the equator between the Tropics of Cancer and Capricorn. There are two broad types of tropical forests. They are tropical moist or tropical dry forests. Tropical moist forests also are known as tropical closed broadleaved forests and are concentrated toward the equator. Tropical dry forests also are known as open forests or woodlands.

Forests can be open or closed. A closed forest has a dense canopy of leaves and branches, through which little sunlight penetrates. This is generally the case with tropical moist forests. An open forest, or woodland, is an area where trees are spaced apart so that the sky is visible from the ground. Many tropical dry forests are open woodlands.

Forests are not collections of trees. They are communities of plants in which trees are the dominant species. Forest communities form complex systems of dynamic relationships between trees, plants, and animals. These relationships are influenced by temperature, rainfall, soil type, typography, and altitude.

It is most important to understand that forests are dynamic. A tropical forest tends to be "homeostatic" (self-regulating). It is able to adapt to changes in its environment. Unless weather patterns dramatically and permanently alter, or the landscape is changed (for example, by damming a river or deforestation), a forest will remain a dynamic and vital community of plants and animals. Unmanaged use of tropical forests to meet the immediate needs of people may exceed an ecosystem's ability to regenerate.

Tropical moist forests are especially complex ecosystems. The distance between the forest floor and the topmost leaves of the tallest tree is often up to several hundred feet. In between, exists several different worlds. A forest can be divided like a layer cake. The forest floor is home to herbs, shrubs, and mosses, ground-dwelling mammals, reptiles, and insects. Moving upward, low-lying shrubs, bushes and trees are another habitat. The taller trees often have trunks that are clear of branches for as much as a hundred feet. This open space is filled with vines, birds and flying insects. The canopy itself, perhaps a hundred feet thick, is home to tree dwelling animals, such as monkeys and birds, shrews, squirrels, reptiles and amphibians, insects and epiphytes (plants that grow on other plants.)

The canopy of a tropical moist forest, like the forest itself, can be divided into different "habitat zones." The upper zone receives the most sunlight and the most rain. It is the hottest part of the forest. Any plants and animals living at the top have specially adapted to the abundance of sunlight and water. Deeper into the canopy mammals, some which might never touch the ground, swing, jump, climb and glide from branch to branch, eating frogs, insects, bird's eggs and plant matter. As they live and die, plants and animals in the canopy generate large amounts of organic matter, which, along with the water and sunlight that has passed through the canopy, creates a gentle and perpetual, life-sustaining shower falling to the forest floor.

Tropical moist forest areas are divided into tropical rainforests (TRF) and tropical seasonal forests (TSF). The distinction is due to geographical location and climate conditions.

The TRF's, clustered around the equator, have no seasonal changes, and receive over four feet of rain per year. These forests are characterized as rich in species diversity and with extremely high volumes of vegetation. Other terms for TRF's are aseasonal forests, lowland evergreen forests, or wet forests. TRF's have an extremely heterogenous mix of tree species with few dominant species emerging from the thick canopy of many smaller trees. Consequently, TRF species are not as sought after by commercial loggers as TSF species. Also, due to the hostile environment and climate, conversion of these forests has not been as rapid as the TSF.

Tropical seasonal forests (TSF), on the other hand have more distinct wet and dry phases. These forests are generally located outward from the equator, along the fringes of the tropical rainforests. Their structure is simpler, having lower canopies than tropical rainforests, and a more homogenous species mix. Deciduous species dominate where the dry seasons get longer and precipitation falls. TSF is a group name that includes moist tropical deciduous forest, tropical semi-evergreen forests and tropical monsoon forests. Most of the deforestation associated with tropical forests occurs in these types of forests. Much of the commercial and sought after tropical woods come from these seasonal forests. The forests are also more suited to human habitation, and consequently are rapidly being deforested.

Dry forests are also seasonal forests but with distinct wet and dry seasons and low rainfall. They are generally located outward from the equator, along the fringes of the tropical rainforests. Their structure is simpler than moist forests. They have lower canopies and a more homogenous species mix. Deciduous species dominate where the dry seasons are longer and precipitation lower.

While the wetter forests have a greater range of species than the drier forests, tree species in the drier forests are much hardier and able to withstand a wide range of temperatures and variation in rainfall. Many tropical dry forests are open forests and woodlands. They range from the tall deciduous stands separated by open grassland such as the "miombo" belt in Africa, to more open grasslands and shrubs as rainfall decreases. Fire, herbivores, soil nutrients, and periodic drought are the principal factors modifying the structure and composition of dry forests

Dry forests are prone to be swept by fire. Fire-resistant trees, such as certain Acacia and Eucalypt species, are the natural survivors for such instances. In these forests a fire acts to clear out the undergrowth, allowing the eventual growth of grasses favored by some grazing animals. When forage dries up, animals eat the bark off trees, and nibble their twigs and branches. The rainy season brings a period of remarkable activity: dry riverbeds and lakes (sometimes called "pans") are filled, providing drinking water for wandering animals, habitat for amphibians and migratory birds, and triggering a reproductive cycle in flowering plants and animals otherwise dormant. The entire ecosystem uses the wet season to rebuild, regrow, and strengthen itself. Indeed, when the riverbeds again run dry, many animals leave the forest in search of food and water. Only the specially adapted can stay. The cycle of growth and change in a dry forest is slow, but significant. Scarce water resources emphasize the delicate balance an ecosystem maintains.

Cloud and montane are other types of tropical forests. They are at higher altitudes and are characterized by lower canopied and less well-formed trees. There also are more ferns, and mosses. Mangroves and swamp forests are commonly found along coastlines, estuaries, and tidal, swampy areas. Common characteristics include the ability of trees to survive in water, dense and lush vegetation, and a few dominant species. Mangrove forests are tolerant of seawater, while swamp forests are associated with freshwater.

Major Forest Regions of the World

There are over 8.6 billion hectares of natural open and closed forests in the world. They cover about 30 percent of the earth's total land area. They are disappearing at a rate of approximately 0.3 percent per year, or an area about the size of Pennsylvania. The tropics have over half of the world's forests. Africa has 20 percent, Asia about 15 percent, and tropical Central and South America about 25 percent of the forests. In the early 1990s, these forests were converted at different rates. Asia had the greatest rate of deforestation at 1.1 percent per year, while Latin America and Africa were losing their forests at 0.7 percent per year. Almost all of the deforestation in the world in the 1980s and early 1990s, occured in tropical regions.

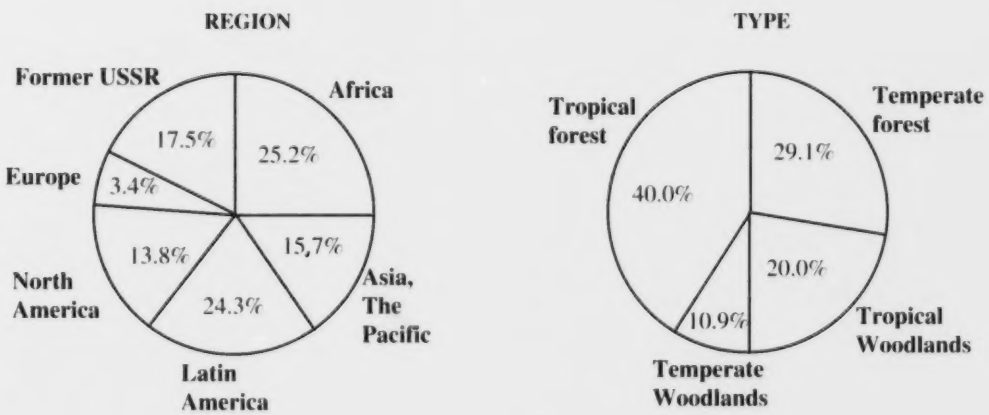
Overall tropical forests were disappearing because of human population growth development pressures, rural poverty, and the need to clear land for agriculture, and grazing. In most temperate regions, forests reclaimed land that had been abandoned or withdrawn from agriculture.

ANNUAL DEFORESTATION RATES FOR TROPICAL FORESTS 1981-90

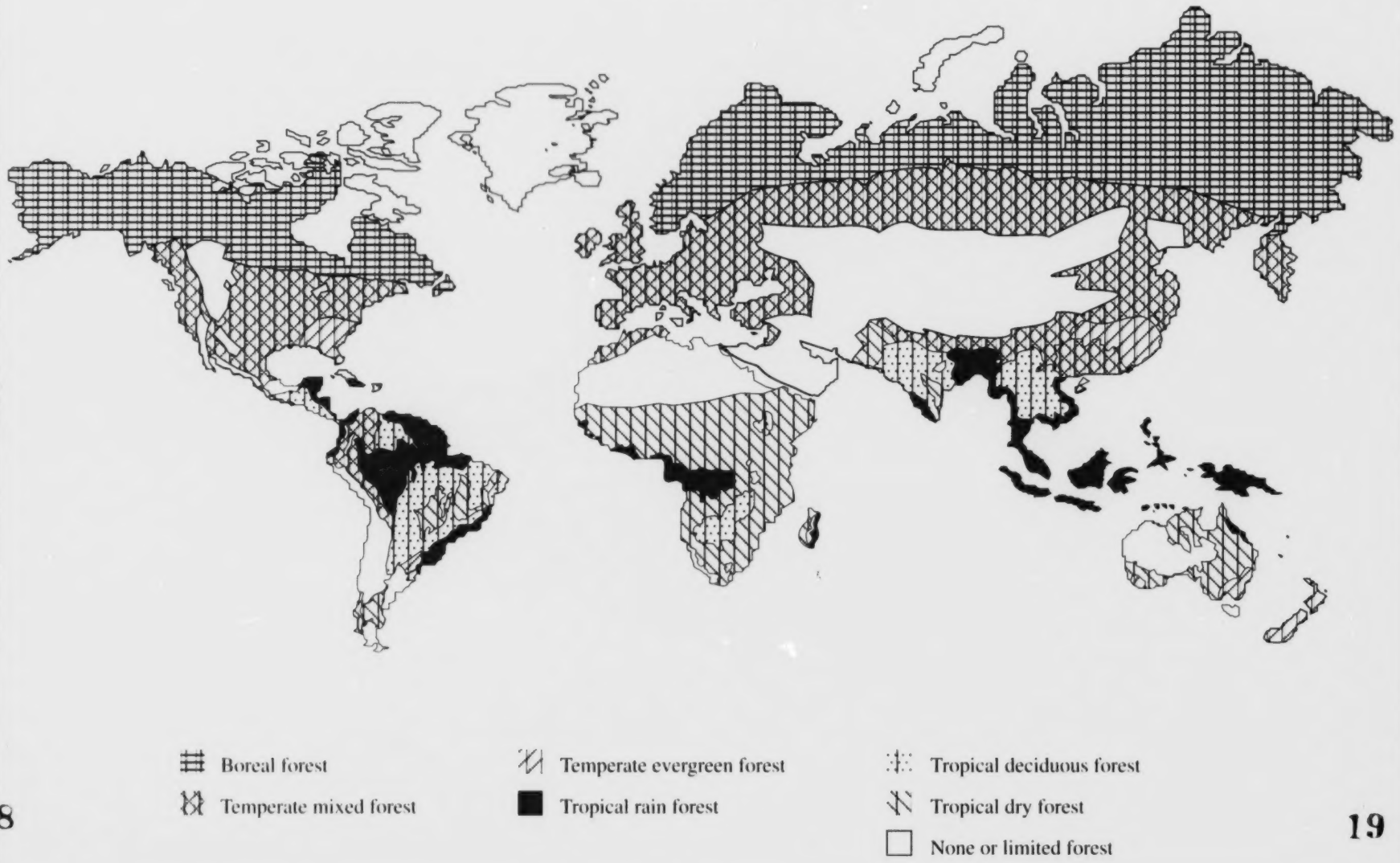
Forest Zone	million hectares	% per year
Tropical Rainforest/Aseasonal	4.6	1.0
Tropical Seasonal	6.1	1.0
Tropical Dry	2.2	0.9
Tropical Cloud & Mountain	2.5	1.1
TOTAL	15.4	0.8

Source: FAO Forest Resources Assessment

FIGURE 1 & 2. FOREST AND WOODLANDS DISTRIBUTION



World Forest Zones



Lessons and Activities

Understanding the issue of tropical forest change as a global issue is an important first step is defining responsible citizen roles for 21st century. This means knowing about several different features of development and change.

- Interrelations and Interdependence (Lesson 1)
- Stability and change (Lesson 2)
- Human responsibility (Lesson 3)

LESSON 1: Interrelations and Interdependence

People, nations, and environment are all interconnected. Recognizing mutual interdependence between peoples, nations, and places is important for learning how human action shapes the world, and also how people can contribute to positive change.

ACTIVITY 1: ***Where in the World are the Tropics?***

Concept: Tropical forests are located near the equator, between the Tropic of Cancer and the Tropic of Capricorn. There are different types of tropical forests.

Objectives:
1. Students will identify and locate the continents.
2. Students will identify and locate the major latitude lines that serve to locate the tropics and tropical forests.
3. Students will locate tropical forests.

Related Subjects: Geography, English, and social studies

Prerequisite Knowledge: Location of the continents
Familiarity with major latitude lines

Materials: World maps (outline only), construction paper, yarn (red and blue), newsprint

Vocabulary: Equator, Tropic of Cancer, Tropic of Capricorn, latitude, longitude , continent, tropics, savanna, rainforest

Time: One to four class periods

Procedure: *Day 1: Creating maps from memory.*
1. Divide the class into groups of 3-4 students.
2. Provide large sheets of newsprint (or suitable substitute), construction paper, and yarn for each group.
3. Without looking at a globe, atlas, or map of the world, ask each group to identify the seven continents and cut shapes from construction paper to represent each continent. The shapes should be glued to the newsprint and labeled to resemble a world map. Add yarn to represent the latitude lines (red for the Equator and blue for the Tropics of Cancer and Capricorn).
4. Display the student maps that were drawn from memory and a map of the world. Have groups compare their "maps from memory" with the world map.
5. For homework, each student should write a brief paragraph comparing his/her map to the world map and be prepared to read the paragraph the following day.

Day 2:

1. Select up to five students to read their paragraphs from the previous day.
2. On the outline map of the world have students identify and label the three major latitude lines & seven continents using an actual map as a guide.
3. Assign each group one region of the tropics. Have the groups research the location and types of forests in their regions and color the forest locations on the map.
4. Connect all student maps to create a bulletin board display. Extend the lesson to include research about products from the regions, cultural activities, political systems and so on.

Discussion:

Students discuss the importance of location to the type of forests found in a region: How do amount of rainfall, frequency of rains, and altitude influence forest type?

Evaluation:

1. Students will write a paragraph comparing the "map from memory" with an actual world map.
2. Modify the (Day 1) map from memory by having students create a tropical forests location map from memory.

Enrichment/ Extension:

Each group researches the forests of their region. Groups identify the natural resources, agricultural products, cities, climates, and economic activities of the region. A class presentation is given by the group including student maps, research, and other student generated materials.

ACTIVITY 2: ***Its a New World Out There***

Concept: The activities of people in one area of the world affect other people throughout the world.

Objective: Students will develop an appreciation for current events and the economic, cultural, and environmental interdependence of nations.

Materials: Periodicals, newspapers, news releases, other resources

Time: One 40 minute period in class; moderate outside research

Procedure:

1. Have students pick a specific country and issue, and follow it in newspapers, magazines, or through television/radio news broadcasts.
   (Depending on the age and awareness levels of the students, the teacher may wish to guide the students to the country or issue)
2. Next, have students answer the following questions as a class discussion, or in a written assignment.
   – How many times has it been in the news over the last two days? last week? month? year?
   – How would you classify this issue?
   Is it an environmental
   - social
   - political
   - economic
   - education issue? Does it fit many categories?

   – How many other countries and different organizations are involved?
   – Directly or indirectly? What role do they play?
   – How does this issue (or country) affect your life? What is the relevance in your life?
   – How might this issue play a role in the future for forests in general, and tropical forests specifically?

Extension Activity: Set up a "Firing Line" or "McNeil-Lehrer" - type show for students to discuss facts and opinions about the country/issue. (It would be helpful to show a small portion of one of these shows.)

ACTIVITY 3: ***Nurture a Habitat***

Concept: Management of forest resources requires an understanding of the way different species (including people) use the forest as a home and food source. Habitats vary in size according to the needs of species that use them.

Objectives: Students will understand habitats as the natural environment in which animals and plants live.

Related Subjects: Science and geography

Materials: Small area *(a local park, school yard, or even a window box or terrarium)*

Time: One and one-half class periods. *This activitity may be carried out over a school year.*

Background: Tropical forests provide habitat for plant, animal, bird, and insect species. An example of a habitat is as close as your backyard, a park, a portion of your school's property, or a neighboring stream.

Procedure: Choose an area and study it. Make close observations, and record them. You may use a magnifying glass if you like.

Questions to be answered based on your observations.

1. What species live there now? (animals? plant? insect?)
2. What sources of food, water, and shelter are there for the various species? (If carrying this activity over time) How does this habitat change with different seasons?
3. What can you do to improve the area as a habitat?
4. Make a plan to improve the area as a habitat and carry it out. If you cannot implement your plan, what resources do you need, or who can do it for you? For example, a little more water may improve the habitat for plants. Who can assist you in obtaining more water for the site? How will you water the site? How often? What do you expect to happen with these changes in the habitat?

ACTIVITY 4: ***Mind Your Manor***

Concept: Sustainable development requires both individual responsibility and cooperation with others who have different economic opportunities.

Objectives: Students will
1. Identify continents and major population regions in the world.
2. Define foresight.
3. Write a one-page essay describing individual actions representing foresight and planning.

Related Subjects: Geography, language arts, social science, and civics

Skills: Identification, comparison, discussion

Materials: String/tape, globe, colored paper, paper (lined or plain) or 3 x 5 index cards, scissors, pens/pencils, information cards.

Time: One class period

Preparation:
1. Locate a wide staircase, gymnasium, bleacher, or auditorium - anyplace where the students can sit in elevated rows. With string or tape, mark off 6 - 8 feet on 5 consecutive rows. With different colors of paper, label the bottom row "Africa," the next row "Asia," the next row "Latin America," the next row "Middle East," and the top row "North America, Europe, and Japan."
2. Make the information cards using the Earthly Manor information on the next page.
3. Based on the exact number of students in your class, calculate how many individual colored pieces of paper you will need. They should match the ratio and colors of the regions below in order to arrange the students into a pyramid shape. Place the colored pieces into a container.

blue	**X**	Europe, etc.
red	**XX**	Middle East
yellow	**XXX**	Latin America
green	**XXXX**	Asia
white	**XXXXX**	Africa

(Note: This may be easier on the floor as in a giant "Twister" game, instead of in bleachers.)

Earthly Manor Information Cards:

1. The roof of Earthly Manor is made of ozone, the best material known to humans for shielding us from the harmful rays of the sun.
2. Our oxygen supply and other atmospheric gases are stored underneath the ozone - in the attic.
3. Each human living in Earthly Manor consumes 100 quarts of atmospheric gas per hour in order to survive.
4. Originally the oxygen comes from the basement or foundation of the building, which is supported by a mixture of topsoil, forests, rangelands, and minerals.
5. Our plumbing system runs throughout Earthly Manor - the water may be used by one tenant, then recycled and used by another.
6. We are rationed to use 1% of the water available in the plumbing system, as 97% is salt water and 2% is frozen in the pipes.
7. Earthly Manor has five floors. The apartments on the ground floor are over-crowded and poorly finished - the top floors contain penthouses.
8. It doesn't make much difference what color our neighbors are, where they were born, or how they vote. What concerns us the most is whether the other tenants keep their apartments in good repair or let them run down; whether they help make the building a safe and pleasant place to live or cause problems for our family; and whether they respect our privacy.

Procedure:

1. Hold up a globe in front of the class. Have students name the continents. Point out that the different continents are all connected on planet Earth. Tell the students to imagine the Earth floating in space - a big, blue ball. Ask students to gradually begin to reshape the sphere in their mind into the familiar rectangular shape of an apartment building with five stories.
2. Welcome the students to Earthly Manor. Inform the students that they are all tenants of this five-story apartment building but live on different floors. Allow the students to pick one colored piece of paper and sit in the row with the matching colored sign.
3. Once they are all in place, identify which continents are represented by the different rows. Then distribute the information cards to student volunteers. They will begin reading them in numerical order.
4. Ask the students how they feel about their position in the apartment building. Is this an accurate description of the world? Ask the students to consider whether conditions in the apartment house will get better or worse in the future? How and why?

Conclusion:

1. Remind the students that in the apartment house there must be individual responsibility for the collective good of all. People take responsibility for themselves, their families, and their futures all the time. Ask students to give examples of personal action today for a better future (recycling, less consumption of fossil fuels, saving money for college, etc.). That type of action requires thinking ahead, or using foresight and planning.

2. Give examples of nations using foresight to prepare for the future. For example, trees are being planted in Africa to help control erosion so crop production (for household food and income) will be higher, and can continue for a long period of time.

ACTIVITY 5: ***Forests and Parks for Development***

Concept: Sustainable economic development can be achieved through conservation of natural resources. A sound environment and natural resource base is necessary for long-term sustainable development. The two concepts are interrelated and interdependent.

Objectives:
1. Students will research history of forests and parks in the United States.
2. Students will compare benefits of forests and parks with the needs of developing economies.
3. Students will recommend hypothetical park program(s).

Related Subjects: Social studies, geography, science

Skills: Research, classification, analysis and planning

Materials: Role cards, pen/pencil/paper, blackboard

Time: Two class periods

Procedure:
1. Relate history and development of national/state forests, parks and nature reserves to the students, or have them investigate a specific park or reserve. Use the following questions to check your students' knowledge. (Please note that there are major differences in each of the three categories):
   a. For what purposes were national/state forests, parks, and reserves first created?
   b. How have forests, parks, and reserves helped to conserve the environment and wildlife?
   c. What economic value do forests, parks, and reserves have for a country?
2. Conduct the following activity:
   a. Tell the students that you will be distributing two sets of cards. Divide the class in half. One is the "forests" set. The other half is the "development" set. Give each student in the "forest" set a forest card, and each student in the "development" set a development card. Each forest card matches a development card.
   b. Once the students have the cards, they must find the person with the matching card. The only words that the students can say when they meet each other are what they read on their cards.
   c. After two students have decided that they are a match, ask them the reasons why. They should be prepared to present this information to the rest of the class.
   d. After all the students have held this discussion, draw them together and have each pair present the information to the class.

The following roles/characteristics should be printed on 3" x 5" index cards and given to the students as per preceding instructions:

"Forests" (or Forests, or Reserves...)	**"Development"**
A. Forests can preserve animal and plant species, and thus biological diversity.	A. Sustainable development depends on ecosystems that are rich in biological diversity for aesthetic and material reasons, such as for improved foods and drugs.
B. Forests can help conserve valuable natural resources, such as timber and wildlife.	B. Sustainable development depends on wise resource management policies, in industries such as lumber and fishing.
C. Forests protect watersheds and soil, and help stabilize climate.	C. Sustainable development maintains a long-term approach toward land use management for the protection of ecosystems.
D. Forests protect and preserve the traditional lands of native people.	D. Sustainable development respects the traditions and meets the needs of local and native cultures.
E. Forests provide information and resources that help to educate the public on natural resource issues.	E. Sustainable development invests in education for both men and women.
F. Forests provide jobs and training or careers, such as a park ranger.	F. Sustainable development provides employment opportunities for both men and women.
G. Forests are the basis for industries, such as tourism,which provide the country with varied sources of revenue.	G. Sustainable development promotes a diversified economy and not just a single industry, such as the export of sugar or coffee.
H. Forests are used for scientific and technical research to develop new products, such as medicines.	H. Sustainable development encourages the research and development of new products, based on the richness of genetic diversity of the natural world.

Conclusion: Instruct the students to brainstorm and recommend hypothetical programs for forests that may aid in accomplishing the sustainable development goal of a country.

LESSON 2: Stability and Change

Realizing that interdependence is important when learning about changes in tropical forests means learning about stability and change in development. Understanding when change may occur or may not occur is another step in learning how people can be a positive influence in the world.

ACTIVITY 6: ***Do It Yourself Tropical Forests***

Concept: Forests are ecosystems. They are dynamic communities of plants and animals where trees are the predominate plant species. Forests are living systems that change over time.

Objectives:
1. Students will be able to identify interdependent components of a forest.
2. Interpret the significant losses (e.g. extinction of a species) or change (e.g. increased or decreased rainfall) to specific habitats.

Related Subjects: Science

Materials: None

Time: 30 minutes

Background: Picture a tropical moist forest, such as a rain forest.

Here's how one nutrient might move through a rain forest:
1. The nutrient starts in the soil.
2. A tree soaks up the nutrient, along with water.
3. An herbivore (plant eater) eats part of the tree.
4. An omnivore (plant and animal eater) eats the herbivore.
5. A carnivore (animal eater) eats the omnivore.
6. The carnivore dies and decays. The nutrient returns to the soil. The cycle starts all over again.

This nutrient cycle keeps the rainforest alive. What happens if the cycle changes? If there are more carnivores than herbivores? If there is a sudden drop in rainfall? If there are fewer trees?

Procedure:
1. Clear an open space in the classroom
2. Assign each student to a part of the tropical forest as outlined above (water, tree, animal, and so on.) Include parts for sun, water, soil, and people if you wish
3. Now it is time to form a circle! A student from each of the six groups walks toward a cleared area of the class. Six students stand next to each other, facing in toward what will be the center of the circle. Six more students – one from each group – join the circle. Keep adding to the circle in sets of six until all the students are in the circle.
4. All students should now be standing shoulder to shoulder, facing the center of the circle. Have students join hands.
5. Ask the students to turn toward their right; and take one step toward the center of the circle. They should be standing close together, with each student looking at the back of the head of the student in front of him or her. Remind them they are holding hands because all things in an ecosystem are interrelated. Briefly discuss the ideas of interrelationships.

6. **Ask everyone to listen carefully**. Everyone should place their hands on the waist of the person in front of them. At the count of three, you want the students to **sit down...on the knees of the person behind them**, keeping their knees together to support the person in front of them. Remind the students that they noticed all elements of the ecosystem were interrelated when they were holding hands. Now they are going to find out that they all are dependent on one another. Do the lap sit. Discuss interrelationship and interdependence in ecological systems.
7. Don't panic! Students may laugh or fall down, but they still will remember the point you are making: The relationship between different things support one another in an ecosystem. If different things are removed, the ecosystem changes -- if change is too extreme an ecosystem may collapse. Talk with them about the necessary components of suitable habitat for people, plants, and animals.
8. After the students understand the major point - that components of an ecosystem at any point in time are interrelated and balanced the students try the circle activity again! This time ask them to hold their lap sit. Identify a student who represents water. Then say, "It is a drought year. The water supply is reduced by the drought conditions." At this point, have the student who was identified as representing water remove himself or herself from the circle - watch the circle collapse, or at least suffer some disruption in arrangement. You could try several ways - removing one or more students from the circle. Pollution of water supply, urban sprawl limiting availability of all components, or soil erosion impacting food and water supplies. Be creative, and identify specific examples in your community, or forest habitat.
8. Ask the students to talk about what this activity means to them. Ask the students to summarize the main ideas they have learned. How must the circle adjust to remain a circle? Is it still there - or was the change (impact) too great?

ACTIVITY 7: ***Dwelling in the Tropical Forests***

Concept: Tropical forests are habitats for many people -- people are part of forest ecosystems.

Objective:
1. Students will be able to list current economic effects on the dwellers of the forest.
2. Students will list future economic effects on different forest habitats
3. Students will list the social impact that current events have on the forest dwellers.

Related Subjects: English, social studies, economics, and citizenship

Materials: Paper/pen, research resources

Time: Two to three class periods

Procedure: Have each student research one group of people and present findings in a brief oral or written report.

1. Subjects for research include:
    a. Indigenous people such as the Yanomami, the Yagua, or Huaorani of the Amazon, the Penans and Kayans of Malaysia, the Ituri of Central Africa, or the ancient Hawaiians.
2. Students should answer the following questions:
    a. How do indigenous people depend on the forest and particular species in the forest to maintain their way of life?
    b. To what extent are they threatened by deforestation and economic development (including the exporting of other resources, such as oil or gold)?
    c. How are they helped by these changes?
    d. What is the attitude of their government toward them? How are policies of their government affecting them?
    e. What attempts have the people made to organize themselves to enlist the support of other groups?

Evaluation: Ask students to write a paragraph describing the effect of forest change on the lives of an indigenous people.

Enrichment: Have students construct exhibits, dioramas, art displays, clothing, or musical instruments to represent the people they researched.

ACTIVITY 8: ***Forest "Farmacy"***

Concept: Plant species in tropical forests are the source for over 25 percent of modern medicines. Many of the species have yet to be studied thoroughly.

Objectives: Students will list natural healing sources, their uses, and effectiveness.

Related Subjects: English, chemistry

Skills: Research, analysis

Prerequisite Knowledge: Plants contain chemicals; vocabulary of medicines

Materials: Paper/pen, dictionaries and encyclopedias

Vocabulary: Atropine, curare, digitoxin, diosgenin, morphine, quinine, reserpine, vincristine

Time: Two to three class periods

Related Activities: Study the medicine men of other cultures.

Background:

Biodiversity

Tropical moist forests produce the most biomass of any ecosystem. This means that they generate more organic matter than any other environment on Earth. Furthermore, tropical wet forests have the largest number of species of any environment on Earth. As many as 50 percent or more of all plant and animal species exist in tropical wet forests. There may be hundreds or thousands of unidentified species in tropical forests lost to science. This tragedy is compounded by the fact that many of these plant and animal species may be of tremendous economic, scientific and medical value. For example, in a study of one hectare of Peruvian rainforest 275 species of flower were found; 72 yielded products with direct economic value. In the same hectare there were 842 individual trees; 350 yielded products with direct economic value.

Because the environment in such forests nurtures so much life, extraordinarily intense competition between plants and animals exists. In such an environment, where virtually every living organism is both predator and prey, plant and animal species have evolved unique offensive and defensive mechanisms, and have also adapted to exist in every single "ecological niche" in the forest system.

Because there is such an enormous number of species in such intense competition, the gene-pool of a forest ecosystem is extremely diverse. Unique and valuable food crops may exist undiscovered in a tropical forest: citrus fruits and the coffee bean are two well-known examples of this.

Procedures:

Day 1

1. Divide the class into six groups, or whatever number of groups will suit the class size and structure.
2. Assign each group to one of the eight medicines listed in the vocabulary above.
3. Have each group research their particular medicine to find out its source, how and where it was discovered, other places it occurs naturally, what it is used to treat, and how effective it is.
4. Have the groups prepare a brief oral or written report (each group member should have a copy). Groups should prepare a poster of a map that shows the location and distribution of the plant, and a drawing, or photograph of the plant.

Day 2

1. Reshuffle groups so that one person from each of the base groups is in a new group and is not with anyone from the original group.
2. Have each person in the new group present the information about their plant and medicine.

Discussion:

Hold a classroom discussion about the importance of plant medicine. Point out that only a few plants have been studied, but over 25% of modern medicines are derived from plants. What other potential cures are waiting for discovery? Is it possible that a plant that might cure cancer or some other dreaded disease could become extinct due to habitat destruction?

Evaluation:

A written quiz of all the listed medicines could be given to all class members.

Enrichment:

Other medicines could be researched. Advanced students could possibly take plants from their own environment and test them to find out what chemicals they contain. A visit to a drug manufacturer or pharmacy, or a lecture from a researcher or pharmacologist would be interesting.

ACTIVITY 9: ***What a Gas!***

Concept: Forests play an important role in determining climate patterns.

Objectives:
1. Students will understand different positions of countries regarding limiting greenhouse gases.
2. Students will gain an appreciation for the difficulty of reaching compromises.
3. Students will understand the role of forests in changing climates.

Related Subjects: Science, social studies, computers, English, foreign languages, communications

Materials: Computer, printer with paper, modem, phone line

Time: Variable, periodic throughout quarter or semester

Background: The burning of certain materials releases CO_2. The greenhouse effect is a natural phenomenon in which gases in the earth's atmosphere trap heat from the sun. Trees are made of carbon, and when they burn they release carbon into the air. When trees are living, they take carbon from the air.

Procedure:
1. To simulate negotiations regarding the limiting of greenhouse gas emissions, conduct a role-play via computer with other schools in your district or state. Each school or class could represent a different nation such as USA, Russia, or Brazil.
2. For assistance in establishing a network of participants, contact: International Communication and Negotiations Simulations (ICONS), University of Maryland, College Park, MD 20740. This group simulates negotiations on environmental issues, human rights, arms race, and social issues.

Evaluation:
1. Evaluate the accuracy of the arguments on each side. Do the arguments make sense and follow logical progressions? Are students able to respond appropriately to differing views.
2. Compare pre- and post-tests of the issues.

Enrichment: Students communicate with other schools using a computer network. Debate tropical forests and development issues via computer. Have students take printed copies of the debate to reenact before the student body, or make a video of the debate. Students write letters or construct booklets that are plans to reduce CO_2 release into the atmosphere. Have them send there plans to other classes or schools as part of a "global" negotiation to reduce atmospheric CO_2.

ACTIVITY 10: ***Growing Globally***

Concept: Changes in population and technology change the carrying capacity of a habitat.

Objectives: Students will:
1. Define carrying capacity.
2. Relate population size to quality of life.
3. Define technology.

Related Subjects: Social science, biology, economics, science, and civics

Skills: Hypothesize, discussion, evaluation

Time: One or two class periods.

Background: Carrying capacity refers to the ability of a habitat to sustain a population. Technology is the ability of a population to adapt to new circumstances by inventing new tools and ways of managing resources.

Procedure:
1. Define carrying capacity. Emphasize the fact that carrying capacity is in a constant state of change as populations, availability of resources, and technological skills are always changing.
2. Define technology as a way that people adapt to new conditions and solve problems.
3. Read the following to the students:
   On July 7, 1986, the Associated Press reported that sometime during that day, the 5 billionth person would be added to the Earth. The following letter was written to the editor of a newspaper in response.

"To the Editor: In The Oregonian (July 7), Associated Press reported the imminent birth of this planet's 5 billionth person, casting it as "a sobering symbol" with "staggering consequences" of overpopulation. Yet, if all 5 billion were placed on the land area of Canada (-) 3,560,238 square miles – every man, woman and child would have 19,851 square feet of space, with the rest of the continent and the rest of the planet left empty.
All the space and resources we need are here. It's for us to learn how to use them."

4. Ask the students the following questions:
   - Do you agree or disagree with the letter? Why?
   - Do you think that this individual would agree with the theory of carrying capacity as applied to human populations?
   - What enables the human population to exceed limiting factors, such as food scarcity and extreme temperatures?

- Though 5 billion people could live in Canada – and perhaps 5 billion more people could be added to the planet and survive by utilizing advanced technology —what might be the costs to our standard of living?

5. Tell students that the human population of the world may be greater that 6 billion in 2000, and greater than 10 billion in 2025. What might this mean for forest resources, technology, and society?

Conclusion: Ask your students to write their own "Letter to the Editor," in response to a news item from 2025 noting that the world's population has reached 10 billion.

ACTIVITY 11: ***Traditional Subsistence Methods and Land Use Decisions***

Concept: The decisions that people make about forest use can determine what the forest looks like and how it is used.

Objective: Students will discuss and write their land use management decisions concerning traditional subsistence resource use in a "national park."

Related Subjects: science, social studies, agriculture, language arts

Time: Two to three class periods, additional outside research time

Background: The establishment of a national park in American Samoa was enacted by Public Law 100-571 on October 31, 1988. Congress approved this park because it would protect one of the last remaining undisturbed paleotropical forests under direct control of the United States. This will protect one of the last remaining habitats of the Pacific flying fox. *(This goal is similar to preserving old-growth forests in the Pacific Northwest to protect the spotted owl.)*

P.L. 100-571 states, "Tropical forests contain 50% of the world's plant and animal species, contribute significantly to the advancement of science, medicine, and agriculture, and produce much of the earth's oxygen. The loss of these forests leads to extinction of species, lessening the world's biodiversity, reduces the potential for new medicines and crops, and increases carbon dioxide levels in the atmosphere contributing to the greenhouse effect that is altering the world's climate."

P. L. 100-571 also allows people from villages within the proposed boundaries to use the park's natural resources in certain ways. "Agricultural, cultural, and gathering uses shall be permitted in the park for subsistence purposes if such uses are generally prior existing uses conducted in areas for such purposes as of the date of enactment of this Act, and if such uses are conducted in a traditional manner and by traditional methods. No such uses shall be permitted in the park for other than subsistence purposes."

Procedure: Present the background information to your students, and then ask them to consider the following hypothetical situation.

Hypothetical Situation: Tuima'a and his extended family have been farming and fishing for nearly 20 years in an area that is now to be part of the national park. His extended family is made up of people from many villages in the different islands of Samoa. Throughout the years, they have used the crop and fish harvest as traditional family events. They divided the balance between them for home use and small sales to obtain money for necessities.

Shifting cultivation and crop rotation has been practiced on the 10 acres being farmed by Tuima'a. Only two to five acres are planted and grown at one time for a period of up to five years. After that time the land is fallowed to restore soil fertility, and a new area cleared and planted. More than 15 years have passed since the first area was put to fallow, it has begun to grow back. Soon it will be ready to clear and replant.

The farming activities include removing most trees and controlling weeds by cutting or spraying with herbicides. Tillage operations are only used for growing vegetable crops. Insect problems are managed by a combination of mechanical, biological, and chemical controls. Fishing practices include hand nets, pole and line, as well as a traditional tree-derived fish poison.

Discussion:

After students have familiarized themselves with the situation and pursued any other resources for additional background, discuss these questions:

1. What would constitute "traditional manners and methods" of the Tuima'a family's use of the park resources? Are bush knives, chain saws, planting sticks, tractors, weed killers, insecticides, fishing nets, and fish poison appropriate?
2. How would you define subsistence as intended by the congressional legislation, and how does this definition apply to the Tuima'a family?
3. How do the farming and fishing activities of the Tuima'a family relate to the legislative purposes of the National Park?
4. If you were the Park Superintendent, how would you address these issues in a letter to Tuima'a?

For Further or Advanced Discussions:

The following questions require additional research to add to the basic information already presented:

1. Has agricultural practice in this particular area always included non-traditional inputs/approaches (herbicides, fungicides, tractors) How is "traditional" defined?
2. How many people are supported on the 10-acre plot of land? How large is the park? What are the impacts of Tuima'a's family farming practices on the overall park ecosystem? On adjacent lands? What impact will development (if any) of adjacent lands have one the parks?
3. What alternatives are there for families who cannot meet the standards imposed by the enactment of this legislation? Is there any compensation or other land provided for farming? Should there be?

LESSON 3: Human Responsibility

People are part of global and local ecosystems. In many ecosystems, people have become the dominant species. As a result, our actions shape the environment around us.

ACTIVITY 12: ***Dear Tropical Forests***

Concept: Responsible action for tropical forests includes many different types of organizations.

Objective: Students will learn about various organizations involved in conservation of natural resources (locally, nationally, and globally); about organizations that provide assistance to developing countries. Students will participate in activities concerning tropical forestry issues.

Related Subjects: English, journalism, civics

Materials: Paper/pen, list of local, national and global conservation agencies

Time: Two to three class periods (or throughout the term)

Background: Government and non-governmental organizations are working to determine what the future holds for tropical forests. Examples of government organizations include the Food and Agriculture Organization of the United Nations, United States Agency for International Development, and the World Bank. There are many non-governmental organizations such as the Worldwide Fund for Nature, CARE, Rainforest Action Network, and many church groups. All are concerned about the future. They all have different perceptions and different solutions for problems in tropical forests.

Procedures: Students will write letters to different organizations to find out what they do.

1. Have students brainstorm names of local, national and international conservation organizations and government agencies that deal with conservation issues.
2. Have students choose one of the organizations and write a business letter requesting information about its programs.
3. After information from several organizations has been received, students share the information with the rest of the class.

Introduction to Forests of Latin America

Latin American forests account for nearly a quarter of the world's forests. Half of Latin America's forests are in Brazil. Closed forests cover about three-quarters of Latin America's forest area.

There are four major tropical forest regions in South and Central America. They are the:

- rainforest zone of the Amazon Basin
- Atlantic coastal rainforest
- Pacific and Andean forests and
- Central American moist and dry deciduous forests.

The Amazon Basin has the largest remaining rainforests in the world. Brazil's Atlantic coastal rainforest has largely disappeared. Population pressures and land distribution patterns are forcing many poor farmers to claim agricultural land from the forest. The land is converted for new settlements, farms, and cattle ranches.

Many of Central America's forests have disappeared, except in Belize and Panama.

Plantations are becoming an important source of wood in Latin America. Forest plantations may double by the year 2000 to 27 million acres.

Most of the natural forest area (80%) is publicly owned, while the plantations are privately owned. There is an increasing trend to privatization as more settlers claim state land.

Major forest and development issues are:

- agricultural expansion
- cattle ranching
- fuelwood
- industrial wood use
- preservation of species diversity (biodiversity)
- indigenous land rights

Forests of Latin America

- Mountain (temperate evergreen) Forest
- Tropical Rain Forest
- Tropical Seasonal (desiduous) Forest
- Tropical Dry Forest
- None (desert) or limited

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ACTIVITY 13: ***A Global Experiment in Guatemala***

Concept: Sustainable development means that forests and people may have different and sometimes conflicting needs. People must come together to decide how different needs will be met.

Objectives:
1. To discuss sustainable and unsustainable uses of tropical forests.
2. To discuss the conflict between keeping land in use as croplands or grazing lands instead of reforesting.
3. To develop an appreciation of how development in the tropics affects other areas of the world.

Related Subjects: History, geography, social science, civics, science

Introduction: The following role-play is a spring-board to students' discussion of global stewardship issues and demonstrates how difficult and complex issues of development and conservation are. The role-play is based on a real situation when a utility in the United States offered to plant trees in Central America to off-set carbon emissions from its US power generators.

Time: Two to three class periods

Procedure:
1. Assign the following reading for homework (or work through as a class)
   - A Glimpse of Guatemala
   - U.S. Firm Reforests Guatemala
   - any other articles pertinent to reforestation issues in the tropics
2. Assign character roles to individuals, or to a small group which then picks a spokesman.
3. Follow the procedures as written. It may be helpful to set the scene with slides of steep, eroded hillsides in Guatemala (or elsewhere), people gathering fuelwood, small household food plots, slash and burn conversion areas of forests, etc.
4. Answer questions about unfamiliar terms prior to students researching roles.
5. Reinforce the idea of diversity of tropical forest products and uses found in everyday U.S. life.

U.S. Firm Reforests Guatemala

American Forests International Environmental Desk

Southern Edison, one of several owners of the Four Corners coal-fired generation plant in Utah is funding a tree-planting project in Guatemala. Marjorie Smith, president of So. Edison, says that the company is willing to fund the project in part to balance the huge production of CO_2 and other Greenhouse gases produced by the plant as coal is burned to produce electricity. She said that the "Greenhouse Effect" or global warming may disrupt weather patterns and cause the sea levels to rise. Ms. Smith stated further that the trees must remain on the site and not be cut down in order that the goal of removing carbon dioxide be achieved. She added that funding would be stopped if the wood was removed for reasons like firewood.

Contacted by this reporter, Victor Sanchez, a villager from the project area stated, that planting trees on his land would greatly help his family by eliminating the 6-km round-trip hike his wife makes daily to collect firewood. Consequently, leaving the wood uncut permanently is out of the question. He says that though he is concerned about the problem of global warming, feeding his family is his primary concern.

Juan Melendez, a member of the Global Forest Corporation, will actually provide the trees and help the villagers plant them. When contacted by us he stated that enough trees could be planted so that at least the villagers could stop cutting down existing forest trees for fuelwood. He said that eventually enough trees could be planted to accomplish the goals of the power company to the north.

A hearing is scheduled in the near future at the village next to the proposed project site. The villagers will discuss the venture and make a decision on whether or not they will participate in the forestation project.

A Glimpse of Guatemala

Amidst the verdant mountains and valleys of Guatemala lies a country emerging from a time of conflict and turmoil. Its people have suffered greatly but are eager to work toward a more prosperous future. The land itself is both the problem and solution to Guatemala's difficulties. On one hand, it is "the land of eternal spring," where a myriad of flowers bloom throughout the year. Its 33 volcanoes have added ash and minerals throughout its history to make the soil a rich texture capable of sustaining a wide variety of agricultural crops. On the other hand, the country is crisscrossed by ranges of towering mountains sliced by steep ravines often thousands of feet deep. This terrain historically limited communication and travel among villages and allowed small pockets of independent cultures to flourish relatively free of outside influence. In many cases, this has led to the development of very different languages and dialects. It also has stymied economic development and trade.

If you traveled from the southern coast of Guatemala to the central highlands, you would make a rapid climb from sea level to an elevation of 7,400 feet. The road is extremely steep. It passes through many different ecological zones, including a portion of primary rainforest. The rainfall along this 20-mile stretch of road varies from three to twelve feet in a year. It results in an incredible amount of species diversity. In this very small area, you can see many of the possible combinations of trees and agriculture existing under highly varied climatic conditions.

Role-Play:

The mayor of Riobamba, a hypothetical small Guatemalan highland village, has called a meeting to decide if his villagers will be planting trees. The village is in the steeply sloped hills and mountains of Western Guatemala known as the "Altiplano." The people of this village are mostly Indians. They are descendants of the famous Mayans, whose civilization boasted flourishing cities long before Europeans came to their lands. These modern day Indians are mostly craftspeople or poor subsistence farmers, growing barely enough corn and beans to feed their families. It is very difficult for them to afford education, clothing, and medicines.

The Global Forest Corporation (GFC) workers, who are Indians from a neighboring village, have offered to expand a tree planting project to this village. The mayor opens the meeting and then one by one calls on the many visitors to explain why they do or do not want this village to get involved in planting trees. After the visitors have spoken, the citizens of the town express their feelings about what they have heard.

Students *who are* not assigned a specific part will play other villagers at the meeting. The Mayor will represent them and call on them to voice their opinions after the main characters give their reasons to support or oppose the proposed project.

Character:

Town Mayor

Profile:

The mayor of Riobamba is well respected by the villagers. He/she has lived in the village all his/her life. The mayor is not very wealthy and makes a living by farming just as most of the other villagers do.

Objectives:

The mayor is in favor of joining the project, not so much because he/she is concerned about conserving soil or slowing down global warming, but because joining the project may add to the mayor's prestige. However, the mayor is too smart to tell the villagers what to do. He/she wants the villagers to decide for themselves that this is what they want. That is the only way to be sure the village will really do what is needed to make the project a success.

What the Mayor says:

He/she calls the meeting to order. He/she explains that GFC has been helping nearby towns to plant trees. At this meeting there are people from one of these nearby towns, from other parts of Guatemala and even from North America who want to talk to this town about the tree-planting project. The mayor will call on each to state his/her point of view.

Character: Victor Sanchez

Profile: Victor is from the nearby town of Chiquimula. He has a wife and five sons. He and his sons farm a small plot of land. His wife manages the household. Now with GFC's help he plants trees on his land. Before, his wife used to collect firewood for cooking from a forest three miles away. Because they could not grow enough food on their land to feed themselves, Victor left his family for three months a year to work as a laborer in the large coffee or sugar cane plantations several hundred miles away. He had to walk many days just to get there.

Objectives: Victor feels that planting trees has helped his family. He thinks it will help the people of this village, too. He has relatives and friends in this village, and he would like to have them join the tree planting.

What Sanchez says: Now he grows trees on his land. GFC gave him seedlings of fast-growing trees that put nutrients in the soil as they grow. The trees are planted along the contour of the slope of the land. Planting trees this way has slowed down the erosion of his soil. After a few years, his harvests have improved to the point that he does not have to work on the plantations. His wife now cuts branches from the trees they planted, so she does not have to go to the forest for fuel. Leaves from some of the trees are used to feed their livestock, so they can have more and bigger animals. If he can do this on his land, he is sure these villagers can do the same.

Character: Marjorie Smith

Profile: She is president of a company in North America that sells electricity produced by burning coal.

Objective: She is willing to give money so that trees will be planted. However, she does not want the trees to be cut or burned. She wants to get the villagers to agree to plant and protect trees.

What Smith says: Burning coal, oil, and wood give off gases, especially carbon dioxide (CO_2), that trap the heat from the sun in the earth's atmosphere. This can increase the "Greenhouse Effect" or global warming. Global warming may disrupt weather patterns and cause sea levels to rise. Everyone on the earth is likely to suffer. So that her company can balance its contribution to this problem, she would like to help get trees planted. This is because growing trees take CO_2 from the air and turn it into organic matter such as leaves, bark and wood. However, if the people who plant trees use them all for firewood later on, the balance will not be struck. Therefore, if the villagers only want to plant trees that they will cut down for firewood, she will not help pay for the project.

Character: Juan Melendez

Profile: He is a GFC extension worker. His job is to train farmers like Victor Sanchez to plant trees. Juan is also Guatemalan, so he is aware of the importance of fuelwood.

Objective: Juan is interested in improving the lives of his people. He knows that planting trees can help them in many ways. If by doing this they also alleviate other environmental problems, that is fine, but that's not his main concern.

What Melendez says: He explains to Ms. Smith that the people there need fuelwood. If they don't plant trees for fuel, then they will have to cut down the forests, and that will add to the world's global warming. He explains to the villagers that trees have many other good effects and uses, like providing fruits for home consumption or sale, preventing soil erosion, feeding animals, regulating rainfall, and holding moisture in the soil so that there won't be floods and the rivers will have water in them all year round. He asks Ms. Smith to fund the tree planting project. The money is needed to pay salaries of the GFC extension workers such as himself and to set up nurseries where the tree seedlings are produced. Even though they plan to sell seedlings, there are start up costs. Juan suggests that the people agree to plant trees. Some of the trees they plant may be used for firewood, but they will agree not to cut down all of the trees, such as the ones that provide fruits and animal feed. They will protect the forests from logging companies and burning to clear for rangelands.

Character: Colonel Garcia.

Profile: He is a Ladino — that is, he is a mixture of European and Native American ancestry. He is from a lowland city, and is now an officer in the Guatemalan Army.

Objective: He is opposed to the proposed project for two reasons. He has traveled to this out-of-the-way village because he wants to talk the villagers out of joining the tree-planting program.

What the Colonel says: First, he thinks North Americans should stay out of Guatemala. If they have trouble burning too much coal up north they should fix it in their own country. It is up to Guatemalans to decide for themselves what to do with their own country and natural resources. Secondly, he does not like the idea of protecting the forests from logging. The government of Guatemala has a huge debt to North American banks that must be paid back in U.S. dollars, which is what the bankers call "foreign exchange." The banks won't accept Guatemalan currency. The only way to earn U.S. dollars is to sell things to people who will pay in dollars. Tropical forest wood is something Guatemala can sell to earn badly needed "foreign exchange." He says the government of Guatemala should allow logging in the forest to be done only by those companies that have licenses. No one else should be able to cut trees. This way the government can be sure the loggers harvest only the trees that can be sold abroad, and not harm the rest of the forest.

Character: Don Pepe

Profile: He is also a Ladino. He owns vast tracts of land. He owns one of the sugar plantations where Victor Sanchez used to work for part of the year. He also owns much grazing land in the Altiplano on which he raises cattle. None of the people in Riobamba have ever eaten any meat from his cattle. It is all exported to the big cities, or out of the country.

Objective: He is very interested in preserving the right of private property. He feels if people want to plant trees on their own land it is their business, but he is not very much in favor of expanding this tree planting project. He agrees with Colonel Garcia that Guatemalans should make their own decisions without outside interference.

What Don Pepe says: As a businessman who exports coffee, sugar, and meat, he is helping the national economy of Guatemala. He is especially opposed to any plans to protect the forest. He feels poor people from the cities and farmers who have lost their good soil to erosion and other causes should be allowed to start new farms in the jungles and forests. He knows that after a few good years the soil will no longer be good for farming, but then he can buy the cleared land and use it for pasture land. He says this is good for everyone because he will pay people for the land and use it for pasture. He also provides jobs for people on his big plantations at harvest time. And the taxes he pays on his profits can be used to pay off some of the national debt.

Character: Senora Delizo

Profile: She is from one of the poorest families in the village. They have a small plot of land that is not very fertile. Occasionally, one of her sons or her husband works on Don Pepe's plantation to earn enough money to purchase necessities such as soap.

Objective: She wants to do what is best for her family.

What Delizo says: It is good not to have to go so far to get firewood, but it will take years before the trees planted now will have branches big enough to cut for fuel. Her plot of land is too small now to feed her family. She has 10 children who are always hungry. She does not want to use any of her precious land for trees. She wants to plant food on all of her land.

Character: Professora Lopez

Profile: She is another Ladino and an outsider to the village. She is a professor at the National University of Guatemala in Guatemala City. She teaches political science and ecology.

Objective: For both political and environmental reasons, she feels the villagers should join the tree planting efforts.

What the Professora says: Planting trees is one way the villagers can get the most from their farms now, while keeping the land productive year after year. This is what she calls " sustainable development." The population of Guatemala keeps growing, so it is no longer possible for people to keep moving on to new land to farm. Most of the soils in the forest, as Don Pepe pointed out, cannot be used for agriculture for very long. After a while, even Don Pepe's pasture land will not be able to grow enough grass to feed his cattle. She says the best thing for Guatemala is to grow food for the local people. Growing food and cutting down forests for export really only benefits foreign banks. She understands the greenhouse effect, but thinks the people should be able to use the trees they plant for firewood. She argues that people will need to get their fuel from somewhere, and by growing their own, the villages will have less reason to cut down the forests. Protecting the forests also protects the many wild species of plants and animals that will become extinct if their habitats are destroyed.

Introduction to Forests in Africa

Africa, with 20 percent of the natural forests in the world, has about 25 percent of its land area in forest. Nearly 25 percent of that is closed forest, while the remainder is dry forest and scrub. Forest cover ranges from near zero in Egypt, Libya, and Lesotho to over 50 percent in Central African Republic, Congo, Cameroon, Gabon, Senegal, and Zaire.

The only remaining areas of tropical moist forest are found in central Africa. Coastal West African forests are now primarily scattered second growth and forest fallow. Population growth, agricultural expansion, poor forest management, and timber cutting are major reasons for deforestation in tropical West Africa.

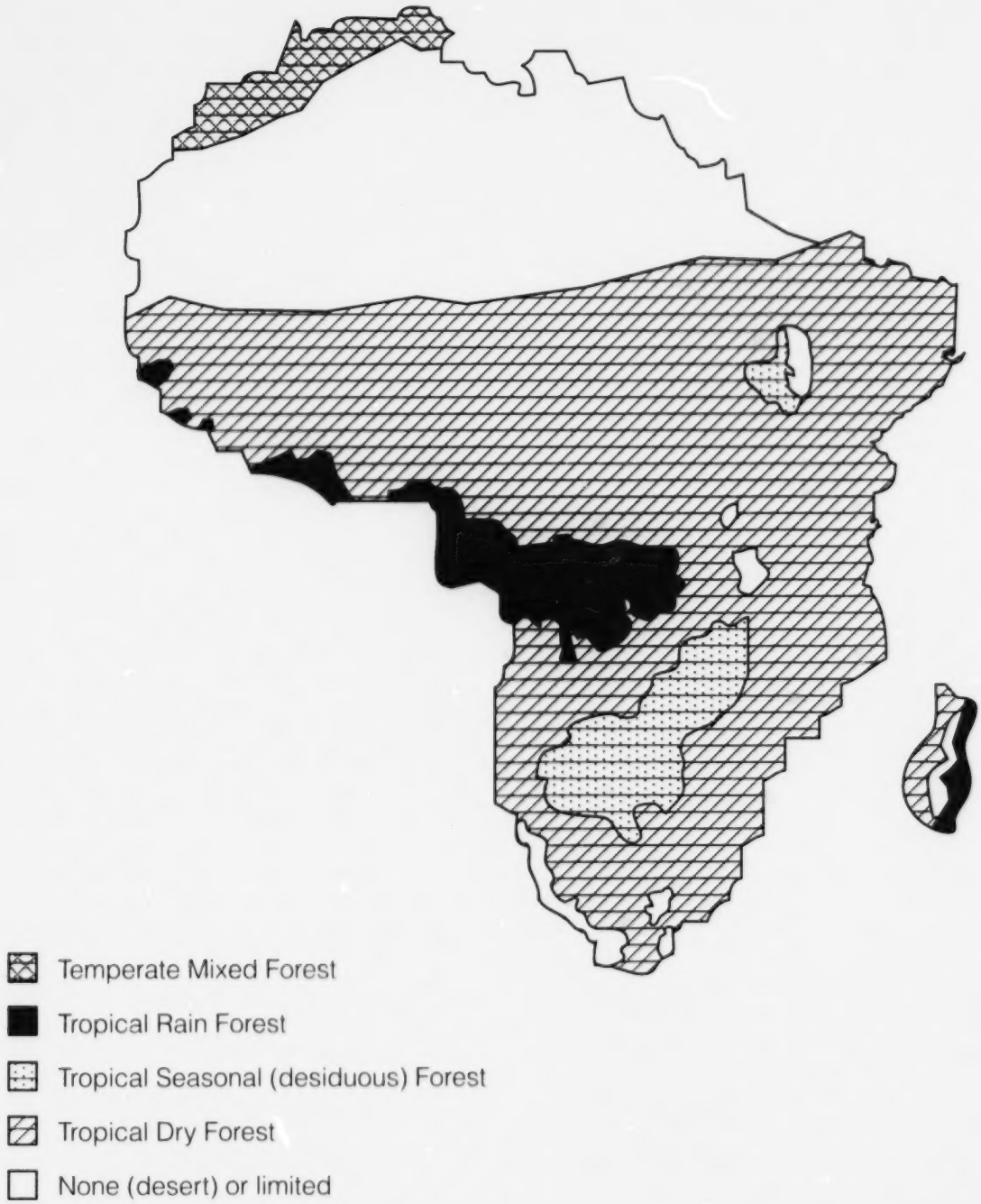
The Sahel bordering the Sahara desert in the north, and the band of forests of west, central and east Africa on its south, is covered with open dry tropical forests. Fuelwood gathering, cattle grazing, and drought have weakened these forests. This region is prone to food shortages and sometimes famine.

East Africa, dominated by a high plateau, has mountainous type forests and forested savanna. The need for agricultural land and fuelwood has contributed to deforestation in this region.

Major forest and development issues are:

- agricultural expansion
- fuelwood
- timber harvesting
- grazing
- drought and famine

Forests in Africa



ACTIVITY 14: ***Burning Down The House***

Concept: People need fuelwood for warmth and cooking. Gathering fuelwood weakens many forests and creates scarcities. Fuelwood scarcities increase difficulties for rural people, especially women.

Objective: Students will research and explore solutions to fuelwood and forest development problems using Kenya as an example.

Related Subjects: Social studies, geography and language arts

Materials: Map of Africa, chalkboard listing of food and cash crops, student handout of Burning Down the House background sheet and script.

Time: Two class periods
Day one: 15 minute teacher introduction
30-40 min. student design of play or cartoon strips
Day two: Play performance or display of comic strips.

Procedure: Hand out background sheet and script.

Have the students decide whether they will:
a. Write a play that includes characters to represent all their group's members or
b. Design a cartoon strip that shows the problems Grace faces.

Background:

The average yearly rainfall in western and central Kenya is 1500mm. There are two rainy seasons in the year. Maize, cassava, sweet potatoes, beans and bananas are the main food crops while tobacco and coffee are cash crops. Farmers who cultivate tobacco in Kenya also grow trees to provide the fuel for curing the tobacco. The scheme has been a success as farmers are indeed growing large numbers of trees. However, many farmers prefer to use the trees for construction timber. They continue to cut natural woodlands for fuel. Tobacco companies give farmers training in fertilizer and pesticide use as well as cultivation and planting techniques. Seedlings and chemical materials are given to eligible farmers on credit, until their costs are deducted from the farm's profits.

Kenya was a suitable area for tobacco production because of an abundance of natural forest and bush cover. Foreign companies required particular farmers to have a large landholding with sufficient scrub and trees to meet their fuel needs for at least seven years.

Farmers cure their tobacco before selling it. The curing takes place in large sheds built by the farmers. Unlike U.S. tobacco barns, Kenyan barns have thatched roofs and can catch fire.

The farmers live in extended family groups. Their homes have a protected pasture area. Population density in the area is already high and increasing rapidly .

Women are responsible for fuelwood collection, but men own the land. Fuelwood areas are depleted and the land grows cash crops, which include trees planted for future sale as lumber. Very few resources (except for female labor) are allocated to fuelwood production. Many women must travel long distances in search of fuel making it difficult for them to adequately tend to their responsibilities. More money is spent on fuelwood, clothing, or food. As money becomes a necessity, an increasing number of men are moving into the cities to earn money. Unfortunately, this often only heaps more responsibility onto the women to find fuelwood and grow food.

In Western Kenya, women store firewood in Lilungo, a special hut, so there will be fire in the homestead, and hot food when their men come home.

Today, the Lilungo is frequently bare as fuelwood resources are almost used up. Women are often responsible for farming crops, cooking, household duties, and gathering fuelwood. Gathering firewood daily is a big problem. They generally cut branches from small trees or gather deadfall from them. As women deplete wood resources from their property, they must find other locations. Their travels often take women far from home and eats into the time needed to accomplish many other responsibilities. The women often do not have the money to buy fuelwood.

In the following scenario, a young Kenyan women named Grace Odinga reaches a point of desperation when she discovers her Lilungo is bare. No fire means no food, and her husband, Okunyanyi, will not be pleased when he returns from his new job in Nairobi many miles away.

Script for Burning Down the House

(Adapt the following script for a play or cartoon strip.)

1: Grace: "Oh, firewood....firewood...where can I find some?"
2: "I have to walk so far and don't have time to work in our field...."
3: "I guess the children can help some, but if I don't get the work done crops will suffer."
4: "If the crops fail, we will have no money, no food, no clothes, no crops next year."
5: "And that Okunyany yells, "Where's my food, hot water? Lazy, what have you done all day?"

As she looks around the house, Grace notices a branch in the wall of the house just about the right size needed to keep the fires going. She grabs it and.....

6: Crack!

7: "Aha, I have some wood for my fire now! It cost me no time, no money."
8: "Look at this old chair. A little piece of this will make great kindling. He won't notice."
9: "Life is good."

Discussion:

Have students discuss the following:

How long can Grace continue "burning down" her house?
What other alternatives does she have?
How could her husband Okunyanyi help?

Extension:

Just as Grace has to spend more and more of her valuable time gathering fuel, Americans are spending more and more money on increasing utility costs. Think about the different utility increases you have heard about in your own home. What actions could you personally take to lessen these costs for your own family? Examine different utility bills with your parents. Your electric bill may compare the number of kilowatt hours your family consumed last year with this years. Sit down with your parents and discuss possible strategies to reduce the amount of electricity consumed in your home.

ACTIVITY 15: ***Case Study - The Okavango***

The Okavango, covering more than one-third of Botswana (a country the size of France), supports a unique tapestry of species in its variety of habitats. Many animals of its delta are adapted to an aquatic environment. Fishing birds such as the African fish eagle *(Haliaeetus vocifer)* and hammerhead *(Crocodylus niloticus)* hunt fish and game in the shallow waterways and grow to over 20 feet in length. Large crocodiles sometimes pose a threat to humans traversing the delta on foot or in dugout canoes.

The hippopotamus *(Hippopotamus amphibius)* is common in the delta and plays an important role in maintaining the wetland's character and fertility. Although the hippopotamus spends most of the hot tropical daylight hours in water to avoid dehydration, it prefers to eat the grasses that grow on the riverbanks and floodplains. During the night, hippos leave the safety of the water to graze on land. They reenter the delta at sunrise and excrete nutrient-rich dung that helps to fertilize the water. Large numbers of hippos can be destructive to riverine grasslands, but their excrement is necessary to maintain productive fisheries in the wetland. In their movements from water to land, hippos create trails through dense reedbeds. These pathways open up new water courses and provide passages for antelopes and small game.

Seasonal flooding of the Okavango River flushes the delta with water and fertile sediments, which arrive in the delta's southernmost parts during the dry season. Great herds of African plains animals including zebras *(Equus burchelli)*, giraffes *(Giraffa camelopardus)*, wildebeests *(Connochaetes taurinus)* and antelopes migrate to the floodplains as grazing areas in the surrounding grassland diminish in the dry season. These animals are part of an ongoing controversy following the recent worldwide ban on ivory trading. The reason for the ban is the drastic decline in elephant numbers in recent years, due largely to the activities of ivory poachers. There is reason to fear for the elephants' survival in most of Africa, but not in Botswana, where they still thrive. The government of Botswana claims that the elephant herds are too large for their range, and must be culled. Since the animals must be killed anyway, according to the government, it is wrong to deny a poor country the opportunity to obtain foreign currency from the sale of their ivory. Although Botswana is not the only country making this argument, it is the most convincing, and the issue is very controversial.

In a continent of anomalies, the Okavango is one of the strangest. In the heart of one of the world's great deserts – the Kalahari – lies a huge oasis. It is rich, verdant, and teeming with life. It is sometimes called "Africa's last Eden." The Okavango Delta sits like a brilliant emerald in the red Kalahari sands. It originates in a river in the highlands of Angola to the northwest. Mountain barriers prevent the river from flowing to the sea. Instead, it runs downhill toward the center of the continent. Once out of the mountains, the river flows 600 hundred miles before the nearly level ground and a series of geological faults spread it - fanlike - into a huge delta in northeastern Botswana. There in the searing African sun it begins to evaporate. What is left is swallowed by the Kalahari; in red sands a thousand feet deep, the river simply disappears.

As the many fingers of the river spread out across the sand, they meander through miles of floodplain, distributing up to 700,000 tons of sediment in the world's largest inland delta. This is a green paradise teeming with birds, animals, and plants.

In the northern reaches of the delta, where the water is shallow, slow moving, and in permanent supply, dense beds of papyrus *(Cyperus papyrus)* and other reeds and sedges grow along the water courses. Small islands support riverine forests. The southern reaches of the delta nurture lush seasonal grasslands.

Since before memory, humans have been part of the Okavango — at first the ancient !Kung, then, in more recent times, tribes with names like the baYei, the baTawana, and the ovaHerero settled in the region.

The Okavango began to change when Europeans arrived. They hunted elephants for ivory, rhinoceros for their horns, and other animals for meat, skins, or for sport. Next, they took its mystery – exploring its intricate tendrils, flying over its vast expanses, analyzing its water flow. Now they want to take its life blood – the water that flows through its veins. If they succeed, they may turn Africa's Last Eden into yet another Paradise Lost.

The greatest hope for the continued survival of the Okavango and its wild inhabitants is the stable, democratic government of Botswana. Unlike many other African nations, Botswana has peacefully maintained a multiparty democracy since its independence in 1966. Progressive planning for Botswana's economic growth and a continued emphasis on rural development, including the provision of health services and education to most areas, has allowed the nation to prosper in a decade marked by starvation and political instability in Africa. Ultimately, it is Botswana's care of its citizens that may allow it to afford to maintain the otherwise vanishing luxury of Africa's wilderness.

Thought Questions:

1. Why is it important to secure local support for conservation projects? What are some factors that have contributed to the success of wildlife preservation in the Okavango during a period of mass destruction of much of Africa's wildlife?
2. Do you feel that Botswana's decision to allow regulated hunting in the delta by foreigners and local people is wise? What potential problems might the Department of Wildlife and National Parks face in controlling this resource?
3. Botswana's population growth rate, at 3.4 percent a year, is one of the highest in the world. What effect will this have on the country's natural resource base (vegetation and wildlife)? Can you think of any means the government might utilize to counteract increasing population pressures on national resources?
4. In general, do you feel that ecotourism is a sustainable economic activity? What are some benefits and drawbacks of basing an area's economic development on tourism? What impacts will tourism in the Okavango have on the region's people and the vegetation? What is the impact on wildlife?
5. What are the arguments for and against allowing Botswana and other countries with large elephant populations to harvest and sell ivory?

Note: These questions do not have only one correct answer. They are designed to promote further investigation of the issues raised in this case study.

Introduction to Forests of Asia and the Pacific

Asia and the Pacific have about 15 percent of the world's forests. Most of the forests in the region have broad-leaved species. Asia has the world's largest extent of bamboo forests; China has the most coniferous forests in the tropics.

The tropical rainforests of insular southeast Asia, and the monsoon forests of continental southeast Asia, have about one-third of the world's tropical moist forests. These forests are by far the most important industrial forests in the tropical regions, accounting for over 50% of industrial wood harvested from tropical forests. However, former major exporters of tropical timber - Burma, Philippines, and Thailand - now have severely degraded forests.

Most of the forests on the Indian sub-continent are used for domestic consumption, where modest efforts at establish fuelwood, plantations and environmental protection are underway. Reforestation efforts are not enough to hold the soil and prevent erosion in the uplands and foothills of the Himalayas. Deforestation in these areas causes severe floods.

The Indonesian forests are bowing to population pressures as the government tries to resettle people from the densely populated islands like Java.

Major forest and development issues in Asia are:

- timber harvest
- resettlement programs
- fuelwood
- agricultural expansion
- soil conservation, erosion, and flood control

Forests of Asia and The Pacific

- Temperate Mixed Forest
- Tropical Rain Forest
- Tropical Seasonal (desiduous) Forest
- Tropical Dry Forest
- None (desert) or limited
- Tropical Evergreen Forest

ACTIVITY 16: ***All Around Asia***

Concept: Forest ecosystems cross national boundaries.

Objective: Students will locate and write information about a specific region.

Related Subjects: Geography, math, social studies

Skills: Reading, writing, mathematics

Materials: Large poster board or blackboard on which to create chart, pencil/paper, reference material

Time: One 50 minute class period

Procedure: Organize students into groups. Identify all Asian countries the class wants to study. Have each group select a country. Prepare a chart (illustrated below). Begin to fill in the information for each country. After the chart is completed ask the class a series of questions about how the countries are different and similar. How might each country respond to major forest issues – fuelwood scarcity, population expansion, changing markets, or concerns for biodiversity in the west. Use warm-up questions.
For example:

1. What is the country with the highest mountain?
2. List the natural resources produced by Malasia.
3. What is the population of Indonesia?
4. What language do people in India speak?

Have students complete questions before beginning role-play activities in next activity.

		COUNTRY		
Characteristic	***A***	***B***	***C***	***D***
Types of forests				
Size of forests				
Population				
Languages				
Religion				
Industry				
Agriculture				
Type of government				
"				
"				
"				

ACTIVITY 17: ***India Role-Play***

Concept: In trying to decide the best course of action toward sustainable development, countries must deal with political, ideological and cultural factors. They also must weigh the costs and benefits of each course of action.

Objectives: Students will:
1. Analyze factors that influence decision making processes.
2. Identify long/short-term consequences of each project.
3. Assess each program to determine who is affected and to what extent each program helps achieve sustainable development.

Related Subjects: Social studies, geography, citizenship

Prerequisite Knowledge:
- Students must have geographical awareness of country.
- Students must be able to research some history.
- Students must understand general government procedures.

Background: India is the world's largest democracy, with a population of nearly 800 million people. Since independence in 1948, it has had a parliamentary form of government controlled by a Prime Minister who is a member of the Parliament. Over half of all Indians live in villages and rural areas. The forests which cover about 30 percent of India's land areas are important sources of fuel, fodder, and food for Indians.

Time: Two class periods (minimum)

Procedure: The government has allocated a $7.5 million grant from the World Bank for projects to improve economic growth and equality. The Parliament is to decide which programs will be funded.
1. Review a brief history of India including how a parliamentary government works. Students will represent the Indian Parliament. Either assign or have students volunteer to play the principal speaking roles (on next page). Have them do whatever research is necessary to portray characters accurately.
2. Working independently, students identify projects they believe should be funded. Students DO NOT share the instructions with others.
3. Proposals will be presented to the Parliament (entire class) which will determine by majority vote which programs will be funded.
4. Have the class elect a Speaker (i.e. chairperson) to oversee the debate.

Roles

A. Mr. AJIT PATEL from Gujarat State (Patels are traditional merchants/businessmen) is opposed to a strong national government, especially since rival members from Andhra Pradesh State hold key executive positions.

B. Mr. BANERJEE from West Bengal State (Banerjee were traditionally scholars.) You believe that immediate economic growth is more important than environmental concerns at this time in your nation's development, since it has one of the lowest standards of living in the world.

C. Mr. RAO from Andhra Pradesh State is a member of the ruling party, which has been in power for only a few years after a decade of political instability.

D. Mr. IYER from TamilNadu State (Iyers were traditional priests and scholars). You believe the immediate health and economic needs of the people must be met in order to assure political stability so that plans for long-term growth can be developed.

E. Mr. NAIR from Kerela State (Nair are traditional land owners). You believe that the future of India depends on its conserving its resource base and avoiding industrial pollution, while at the same time promoting economic growth.

F. Mr. THEVAR from TamilNadu State (Thevars were traditional bandits and now agriculturists). You are an advocate of socialism or modified communism to solve the nation's ills. You would like the present government to be replaced with a socialist one.

G. Miss GHANDI from Uttar Pradesh. You are a teacher and represent a Mother's Union. You are very concerned about infant mortality and illiteracy.

Proposals

1. $3,000,000 – Build primary schools to accommodate 200 students in 50 villages of two economically backward states, namely TamilNadu & Andhra Pradesh.

2. $2,000,000 – Install systems to purify water in 200 villages.

3. $2,500,000 – Build highway for carrying lumber from a forest to a viscose factory which makes rayon from wood pulp and is then exported.

4. $1,700,000 – Build, finish and equip four-room health centers in 50 villages in the two largest states: Uttar Pradesh and Madhya Pradesh.

5. $1,000,000 – Make money available to banks so they can make loans of $2,000 with very low interest to 500 farmers to plant trees in the states of TamilNadu and Andhra Pradesh.

6. $2,000,000 – Pay owners of the lumber business a subsidy to reduce the amount of lumber being cut to two-thirds of this year's amount.

7. $1,000,000 – Finance the building of a small factory to make bicycles in the capital and develop a program to train factory workers.

8. $500,000 – Train 100 high school graduates to teach in village schools and run literacy programs.

9. $1,000,000 – Equip 20 minibuses to provide health care and family planning services in remote villages; train and pay salaries of workers in the buses.

10. $500,000 – Survey energy resources including fuelwood as a first step toward reducing oil imports.

11. $100,000 – Train 50 village field workers and pay their salaries for one year; each will teach 100 farmers to use a new kind of seed and improved farming techniques.

12. $2,500,000 – Build urban housing units for 250 families who are presently living in one-room shelters with no electricity or plumbing.

13. $1,000,000 – Establish information center and a family planning program throughout the nation.

ACTIVITY 18: ***Indonesia: Resettlement Role-Play and Case Study***

Concept: Population pressures influence forest ecosystem change.

Objective: Students will analyze factors that influence decision making, identify short/long term consequences of each project and determine the value of each activity to the long term development of the country using human population pressures as an example.

Related Subjects: Geography, social studies

Prerequisite Knowledge: Completion of All Around Asia

Skills: Writing oral expression, listening, critical thinking

Materials: Pencil/paper, and assorted props as desired

Time: Two 50-minute class periods (minimum)

Background: In parts of Asia, human population pressure can determine forest policy. For example, Indonesia has from time to time sponsored migration from overpopulated islands like Java to less populated islands. The forests on the outlying islands give way to farms and towns for the settlers.

Problem: Should Indonesia fund resettlement projects as a way to reduce population pressure?

Procedure: *(Teacher may wish to have students organize and conduct the entire activity by themselves or control the group by giving directions and assignments.)*

1. Divide the class into five groups, and assign students the major speaking roles.
   a. Government official(s) in charge of a program to resettle people from overpopulated areas to undeveloped forest areas.
   b. Representative(s) of a wildlife organization that believes that the forests must be preserved so that existing animal species are not threatened or endangered.
   c. Penan tribal leader(s) who believes that the traditional lifestyles in the forests should not be disturbed and lost to development activities.
   d. Government panel member(s) deciding which course of action to take.
2. Review any background information and complete necessary research to portray the character(s) accurately.
   a. A panel of development experts that must decide whether or not to approve funding for resettlement projects.

3. Each group reviews their research on the issue and prepares a one page position paper supporting or opposing resettlement policy (support or opposition indicated by the spokes person roles).
4. Each group takes turns to present their position. Panel members may ask questions of each group.
5. The panel determines which policy it will recommend, giving reasons why.

Evaluation:

- Each student should complete Pro's and Con's lists for the issue.
- Have students prepare a written statement supporting the opposite side of the issue from the role played in the public hearing.
- Prepare test or quiz (e.g., short answer, fill in the blank, multiple choice).
- Prepare a list of questions to be completed orally while working within the cooperative learning groups.

Roles and Background for Indonesia Role-Play

Character: Pok Pumi

Profile: Indonesian official in charge of resettlement of families to remote forest areas.

Objective: Wants to use resettlement of families into forest areas to create jobs and alleviate poverty. Each family receives eight acres of land, a small house, basic farming supplies (seed, fertilizer) for three years in villages of approximately 150 families. Each village will receives schools, clinics and common facilities. Costs run approximately $8,500 per family. This program is supported by oil money.

What Pumi says: Indonesia is the fifth most populated nation in the world and has more than 100 million people who live on Java an island with 7 percent of the nation's land. Between 1980 and 1986, the government resettled two million people from the over-crowded inner islands (Java, Madura, and Bali) to less densely settled outer islands (Kalimantan, Sulawesi, and Irian Jaya). This was done to provide employment and prevent over-crowded cities. The number of job seekers is greater than the number of jobs available. Two million workers enter the labor force each year. Resettlement is the only way to help these people; opening up the forests for development must continue.

Characters: Joko and Murni

Profile: They are examples of successful resettlement. Joko has a ninth-grade education and worked as a store clerk before resettlement. Murni was an elementary school teacher.

Objective: They think resettlement was and still is a great idea!

What Joko and Murni say: They say that soon after they were married the store where Joko worked went out of business. There was an abundance of teachers. Since Joko lost his job and Murni couldn't find a teaching job, they lived with Joko's father for over a year. When their first child was born, they decided to apply to the government's resettlement program. Through the program they found employment, their own house, and improve the quality of their lives. Our house is small and has a dirt floor. Joko farms 2 acres and is able to meet the needs of our family, says Murni. I earn money teaching in the village school and Joko is a member of the village counsel. Our life is so much better now!

Characters: Joe Nguyen

Profile: A Vietnamese businessman, president of World Orangutan Fund.

Objective: The habitat of the orangutan is being destroyed by development. The government's program of resettlement must be stopped.

What Nguyen says: Orangutans will soon die out in the wild. Less than 2,000 remain in Borneo (Kalimantan) and even fewer in Sumatra. As the human population increases, forests are cut down to make room for farms. When the trees go, the orangutans go. Orangutans have a slow rate of reproduction. The mothers have only one baby at a time and nurse as long as four years. The average female may have only two or three babies in her lifetime of about 40 years. We must preserve what is left!

Characters: Gamay Weway, Mima Chang, Juju Brandalong

Profile: WOF members.

Objective: Support Mr. Nguyen in any way possible; peaceful demonstrations in the hearing room, demonstrations in the forests, placard waving, cheering, chanting, applause, door-to-door campaigns, letter writing, etc.

Characters: Jalam Bangunen

Profile: Penan tribal chief, member of a tribe of nomadic hunters and gatherers from the northwest part of Borneo. The forest provides their staple foods: the starchy pith of the sago palm, uvud (young sago plants), lekak (an edible palm leaf bud), a variety of fruits, and the meat of the bearded pig. The forest also has for centuries provided them with necessary trade items such as camphor, jelutong (a wild rubber), dammer (a resin), gaharu (incense wood), bezoar stone (from the stomachs of certain ruminants believed to have medicinal properties), and rattan (for making the mats and baskets that are in demand in coastal cities). From the forests, the Penan get wood for building houses and boats, and saplings for construction of huts.

What Bangunen says: This resettlement, one of the biggest threats to the forests in Borneo, has been messing up the life of our communities for 20 years. If the farmers come and cut our trees, where will we get trees? How will we make boats?

Characters: Daluk Selleh

Profile: Another Penan leader.

Objective: Stop the settlement.

What Selleh says: We have made appeals and petitions to the government for years. Nothing has happened. While we were making our appeals, almost seven million acres of forest were cut! In 1987, we tried to organize blockades of the roads that have crossed our lands. Entire villages walked for days across the mountains to reach them. The men set up fences and built rest shelters. The women thatched roofs and organized the food. Breast-feeding mothers, old women, young children and men stood vigil at the roads, stopping the settlers for seven months. The army and police forced us to tear down our blockades and arrested some of our men. We came back later, but this time over 100 men were arrested because the government had made a law that says that blocking roads is illegal.

Extension Exercise: ***The Race to Log Borneos 10 Million-Year-Old Forests***

Borneo

The mere mention of the island conjures up a vision of one of the wildest places on earth--vast expanses of thick, steamy jungles inhabited by formidable tribes of exotic birds, red apes and elusive cats stalking through the gloom. Although Borneo was once covered from shore to shore with unbroken tropical rainforests, the present reality is much different.

Today, a visitor to the Malaysian state of Sarawak, in northern Borneo, is likely to find Coca-Cola and Japanese cars. The once great tropical rainforests are now fragmented and threatened. The tropical rainforests of northwestern Borneo, including the entire state of Sarawak, contain more species of trees than any other forest. Botanists have recorded more than 20,000 species of flowering plants and several thousand species of trees (of which more than 100 produce fruit). In addition, 30 species of birds, 39 species of mammals and more than one-third of the plant species on the island are found nowhere else. The key to this tremendous diversity is the great age of Borneo's forests. Unlike other tropical forests, which succumbed to past Ice Ages and have regrown in geologically recent times, Borneo's forest, protected by the island's sheltered climate, has thrived with relatively few changes for more than 10 million years. The forests' ancient stands of *dipterocarps*, sometimes called Philippine mahogany, may reach more than 150 feet in height. Very few large stands of these trees remain in their native Southeast Asia because *dipterocarps* are highly valued for their durable wood.

From Canopy to Floor

Structure is an important characteristic of tropical rainforests. Due to the great height and density of many rainforest trees, the forest can be roughly divided into layers that support different life zones. The main canopy of the forest is formed by the crowns of the taller trees. Although the crowns of a few giants may emerge from the canopy, most canopy species reach a uniform height at maturity. As a result, they form an almost continuous umbrella of leaves that shuts out most of the sunlight. The canopy layer, 65 to 100 feet above the forest floor and exposed to full sun, is the warmest and least humid region of the forest. It is where most of the flowers and fruits are found. A middle layer of trees is formed by younger plants and trees that do not grow tall enough to reach the canopy. Although less productive, this layer serves as a ladder for animals and plants climbing to the canopy layer. Most tropical trees grow very rapidly at the seedling stage if they receive sunlight, as in the gap created by a falling tree. An individual plant's rapid growth allows it to outcompete other plant species for available space and sunlight. The climate of the forest floor is extremely humid with a fairly constant temperature. Since the tallest trees shut out most of the sun and wind, only very shade-tolerant plants can survive on the dark forest floor. Many of the houseplants we have become accustomed to were originally tropical forest plants, adapted to low light. Climbing vines or lianas connect the canopy with the forest floor and provide additional support for the huge trees.

Web of Life

The animals in the Sarawak forests play a crucial role in propagating the numerous fruiting and flowering tree species. Scientists have documented extreme interdependence of some forest animals and plants in Sarawak. Some trees produce large fleshy fruits in order to attract fruit-eating birds and primates that distribute the seeds in their droppings. Birds, such as the helmeted hornbill *(Rhinoplax vigil)*, have developed large bills similar to that of the South American toucan in order to more easily reach fruits on distant branches or, it has been suggested, to rob the nests of other birds. The hornbill is so essential to the reproduction of certain tree species that in some areas of southern Asia, where these birds have been decimated by hunting and habitat destruction, the trees have failed to establish seedlings. Trees also depend on nectar-eating birds, bats, and insects for successful pollination. In rare cases, a tropical rainforest tree may have co-evolved with only one species of pollinator; if one species succumbs to extinction so will the other. Animals on the forest floor often depend on canopy dwellers to drop fruits and seeds down to them. A dramatic Bornean example of a ground-dwelling animal's use of canopy fruits is the mass migration of the bearded pig *(Sus barbatus)*. During the fruiting seasons of Sarawak's dipterocarps, large herds of these pigs move through the forest in search of the fruit. During one migration, in 1983, an estimated one million pigs made up the traveling herds and provided a feast for local people. The bearded pig is an exception in Sarawak. Most of the rainforest's prey animals are found in the canopy. So predators, such as the rare clouded leopard (Neofelis nebulosa) and the smaller cats, are good climbers and spend most of their time in the trees.

Man of the Forest

The orangutan *(Pongo pygmaeus)*, "man of the forest" in Malay, is one of the specialized tree-dwelling primates in the Bornean rainforest. Both native mythology and modern science have identified this large reddish ape as one of man's closest relatives. The orangutan is well suited to an arboreal life. Its arms are extremely powerful and may span seven feet, compared to the five-foot standing height of most male orangutans. The hands and feet are similar, with long curled fingers and a small thumblow on the hand. Their hip and shoulder joints are very flexible allowing the large apes to support themselves while suspended by an arm, a leg, or both. This helps make movement possible through even smaller tree branches. As the second largest nonhuman primate in the world, weight is a major limitation to the orangutan's life in the trees. Even the 90-pound females must move carefully through the canopy and test tree limbs before trusting them with their full weight. Large males, which can reach 220 pounds, eventually spend more and more of their time on lower, sturdier branches or on the ground. Orangutans feed on fruits, leaves,

and the bark of trees. These apes are more solitary than other primates, presumably in order to reduce competition for the widely dispersed food supplies found in the Bornean rainforest. Except for mothers and infants, orangutans usually travel alone through the forest. During peak fertility periods, the females seek out the solitary adult males as mates. Although mated pairs sometimes remain in the same vicinity, the female alone is responsible for rearing the infant. Young orangutans remain with their mothers for up to eight years and do not reach sexual maturity until about 15 years of age. Female orangutans learn how to care for their infants by watching their mothers and sometimes they travel with their mothers during their first pregnancy. Orangutans can live to be 50 years old. Their relationships appear to be affectionate and long lasting. Parents and offspring have been known to embrace upon meeting each other even after long periods of separation.

Orangutans are found only in Borneo and Indonesian Sumatra. In the past, hunting and the capturing animals for pets and zoos was responsible for reducing their numbers. Today, however, the greatest threat to this charismatic species and the rest of the nonhuman and human inhabitants of the tropical forests is logging.

Thought Questions

International organizations are considering a boycott of timber produced in Malaysia in order to influence Sarawak's government.

- Do you think this would be an effective tactic?
- Would a boycott produce any negative impacts?
- Do you think that resource management decisions should be made on a local or national level?
- Which is more effective in regulating the survival of ecosystems?

Industrialized nations played an important role in the depletion of forest resources worldwide.

- Do you think that free market value should apply to natural resources that may not be measurable in economic terms?
- Do you think international action like the ban on whaling imposed upon Japan is warranted in the case of rainforest preservation?
- How might such regulations be implemented?

The future for hunting and gathering cultures like that of the Penan is uncertain.

- Do you agree with the government officials of Malaysia who believe that the best solution is to settle and acculturate the Penan? What alternatives exist?

Sometimes, rehabilitation of formerly captive and orphaned orangutans is a response to their decrease in numbers.

- Aside from the problems mentioned in this case study, what are some of the negative consequences of the program that has been initiated?
- Do you think that increasing the number of organutans on the island of Borneo is a good idea when their habitat is still being destroyed?
- What other actions could benefit the survival of the species?

Note: These questions do not have only one correct answer. They are designed to promote further investigation of the issues raised in this case study.

ACTIVITY 19: ***May the Forests Be With You***

Concept: The future of tropical forests will be determined by the decisions people make about resources. Effective environmental decision-making requires consideration of scientific, economic, political, ecological and aesthetic information.

Objectives: Students will:
1. Define sustainable.
2. List three ways to manage natural resources.
3. Develop a plan for use and conservation of forests.

Related Subjects: Social studies, math, civics

Skills: Listing, creativity, analysis and planning

Materials: Blackboard, paper/pens

Time: One or two class period (minimum)

Procedure:
1. Begin a discussion of sustainable --- what is it? Are the resources of tropical forests being used in sustainable ways now?
2. Discuss with students ways of managing a natural resource. List at least three ideas on the board.
3. Begin this activity by explaining that you will be giving the students certain information about a tropical forest area. Divide the students into groups of five or six. Each group will be responsible for presenting a forest-conservation plan.
4. Have students write down the following information,or copy it on the blackboard:
   - The tropical forest area is located in a small country.
   - The size of the tropical forest area is approximately one-third the size of Ireland with rocky soil and steep hills.
   - 1,500 Indians (indigenous people) live in this forest.
   - Two main rivers run through the forest to the rest of the country.
   - An endangered species of bird lives in the tropical forest.
   - A road from the country's capital was recently built into the forest.
   - Everyone else in the country lives in or near two large cities.
   - Nearly half of the people are farmers.
4. Students should work together to develop a plan for this tropical area. Though they must base their plan on the above facts, the students can also draw upon other information or characteristics of different tropical forest types.

Conclusion: After a planning period of 10-15 minutes, instruct the students to present their plan to the rest of the class. Allow other students to ask questions of the groups and to discuss other options.

ACTIVITY 20: ***Our Common Future***

Concept: Sustainable development may mean changes in development policies, and in private consumption and use of natural resources.

Objective: Students will:
1. Define sustainable development.
2. List terms to describe the development status of other countries.
3. Position countries on the "continuum of development."
4. Identify four factors of sustainable-development.
5. Hypothesize about the application of sustainable development policies.
6. Locate countries on the globe using absolute location and/or relative location.

Related Subjects: Geography, economics, English, and civics

Skills: Comparison, listing, hypothesizing

Prerequisite Knowledge: Students should have worked through the previous 19 activities.

Materials: Chalkboard, world map, atlas, globe

Time: One 50 minute class period to five class periods.

Background: In 1987, The World Commission on Environment and Development defined sustainable development as a process that meets the needs of the present without limiting the potential for future generations to meet their own needs.

Procedure:
1. Tape cards on the board, one for each of the following terms:
   Sustainable development
   Underdeveloped
   Developed
2. Have students brainstorm words, thoughts, or ideas about each term. Record student responses on the board and follow with a class discussion about each term.
3. Divide the class into cooperative groups of three to four students. Each group should discuss and clarify among themselves any discrepancies in how the terms are defined.
4. Each cooperative group should be assigned countries to be located on the globe, using absolute and/or relative location. A gazeteer may be used to obtain information. Students should then determine to which category each country belongs.

5. Draw one horizontal line on the board. Label the line "development." Inform students that the line represents a continuum of development for all countries. Each group should then determine the location of their countries above or below the line. Each member of each group must be able to explain why a country is placed above or below the line.
6. Lead students in a discussion of sustainable development and the interrelationship of these four factors:
   - economic development
   - population density
   - basic human needs (food, water, shelter)
   - citizenship (responsibility to future generations)

Conclusion:

Conduct class discussions.

1. How can the principles of sustainable development be applied to countries that are very different from one another?
2. Is sustainable development only for nations that are now less industrialized ftan western nations?
3. How can an industrialized nation such as the United States begin to implement sustainable-development policies?

Evaluation:

1. Have students collect current examples of industrialized countries, First World countries, underdeveloped countries, Third World countries, sustainable development, etc.
2. Create a scrapbook of the examples either individually, in groups, or as a class.

Enrichment:

1. Divide the groups into industrialized and underdeveloped countries. Each group receives a quantity of candy based upon their level of development. They, in turn, must divide the candy among the group members. Have students compare the different levels of wealth among the groups (countries). Compare each groups level of wealth. Discuss development, sustainable development, and the importance of natural resources (especially trees and forests).
2. Students or groups may research a specific country and create a class presentation, bulletin board, display, etc.

Additional Resources for Teachers & Students

Glossary

AGROFORESTRY - Land-use system in which trees are grown on the same land as agricultural crops.
BIOLOGICAL DIVERSITY/BIODIVERSITY - Total quantity of organic matter produced by a plant community.
BROAD-LEAVED SPECIES - Also known as hardwood nonconiferous species. This is a botanical classification. Not all broad-leaved species have broad leaves. Trees are either broad-leaved or coniferous
CLOSED FORESTS - A stand of trees where the tree crowns touch one another.
CONIFER/CONIFEROUS SPECIES - Softwood species. They are mostly evergreens.
CONSERVATION - Producing goods and services in a way that protects the environment and resource species.
ECOSYSTEM - The system of living organisms and their environment.
ENVIRONMENT - The setting in which anything exists. There are both manmade and natural environments.
HABITAT - Place or site where an organism naturally lives.
OPEN FOREST - Trees cover at least 10 percent of the ground area. Grass cover is continuous, allowing grazing and fires.
PRIMARY FOREST - Unmodified by human activity, or modified only by hunting and gathering activities of indigenous people.
SHIFTING CULTIVATION (also known as Swidden or Taungya) - Farming system in which land is periodically cleared, farmed and returned to fallow; also called slash-and-burn agriculture.
SHRUBLAND (also known as Brushland or scrubland) - Shrubs or stunted trees cover more than 20 percent of an area; not used for agriculture or other non-forestry purposes such as grazing.
SILVICULTURE - Science and art of growing tree crops.
SOCIAL FORESTRY - Community-based forestry.
SUSTAINABLE DEVELOPMENT - Meets present needs without compromising the ability of future generations to meet their own needs.
SUSTAINED YIELD - In forestry, the yield that a forest can produce at a set pace without using-up the resource base.
TROPICAL DRY FOREST - Open forest with continuous grass cover; distinguished from other tropical forests by distinct season and low rainfall. Includes woody savannas and shrubland.
TROPICAL MOIST FOREST - Situated in areas receiving more than four inches of rain in any month of the year for at least two out of every three years. The mean annual temperature is 74 fahrenheit or higher. Tropical moist forests are mostly low-lying and generally closed. They are subdivided into tropical rainforests and tropical moist deciduous forests.
WOODFUEL - These are fuels such as charcoal and firewood that are used for the most part to cook food and warm homes throughout the topics.

People and Organizations

Contact your State, Cooperative Extension, and City Foresters through:

Cooperative Extension Program
State Department of Natural Resources
Environmental Protection Agency
City Department of Parks and Recreation, or
Local Nature Center

Contact your local Global ReLeaf group:

AMERICAN FORESTS
1516 P St., NW
Washington, DC
20005
Contact: Global ReLeaf Coordinator

"Ag in the Classroom"
USDA
Washington, DC 20250-2200

Development Education Program
Office of the Publisher
The World Bank
1818 H St., NW T8082
Washington, DC 20433

Edison Electric Institute
Education Service Department
701 Pennsylvania Ave, NW
Washington, DC 20004
Contact: Director of Educational Services

Epcot Teachers Center
Walt Disney World
P.O. Box 10,000
Lake Buena Vista, FL 32830

Forests, Trees, and People Programme
Community Forestry Unit
Forestry Policy and Planning Division
Forestry Department
Food and Agriculture Organization
Via delle Terme di Caracalla I-00100
Rome, ITALY

National Clearinghouse on Development and Environmental Education
American Forum on Global Education
Suite 908
45 John St.
New York, NY 10038

National Consortium for Environmental Education and Training
School of Natural Resources and Environment
University of Michigan
430 East University Ave.
Ann Arbor, MI 48109

National Council for the Social Studies
3501 Newark St., NW
Washington, DC 20016

National Science Teachers Association
1742 Connecticut Ave., NW
Washington, DC 20009

North American Association for Environmental Education
Box 400
Troy, Ohio 45373
Contact: NAAEE Membership and Publications Office

Office of Environmental Education
United States Environmental Protection Agency
401 M St., SW (A-107)
Washington, DC 20460

Project Learning Tree
American Forest Foundation
Western Regional Environmental Education Council
1250 Connecticut Ave., NW #320
Washington, DC 20036
Contact: Curriculum Manager

Project Wet (available in 1994)
Montana State University
335 Culbertson Hall
Bozeman, MT 59717-0057
Contact: Project Wet Director

Project WILD
Western Regional Environmental Education Council
4014 Chatham Lane
Houston, TX 77027
Contact: Project WILD Director

Science, Mathematics, and Environmental Education
Analysis Center
Information Reference Center
Room 310
1200 Chambers Rd.
Columbus, OH 43212-1792

World Food Day
Suite 300
1001 22nd St. NW
Washington, DC 20437

Worldwise Schools
United States Peace Corps
1990 K St., NW
Washington, DC 20526
Contact: Program Director

Publications and References

American Forests and ***Urban Forests***
P.O. Box 2000
Washington, DC 20013

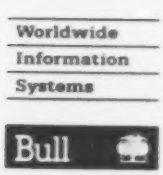
Conservation Directory
National Wildlife Federation
1400 16th St., NW
Washington, DC 20036-2266

Forests, Trees and People Newsletter
Editor
IRDC
Swedish University of Agricultural Sciences
Box 7005
S-750-07 Uppsala
SWEDEN

Managing the World's Forests: Looking for Balance Between Conservation and Development
Sharma, Narendra (ed)
Kendall/Hunt Publishing Co.
Dubuque, IA

National Geographic Society Education Program Catalogue
17th and M Sts., NW
Washington, DC 20036

World Resources 93-94
World Resources Institute
1709 New York Ave., NW
Washington, DC 20006
To Order: 410/516-6963



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